

PCT COOPERATION TREATY

PCT

NOTIFICATION OF THE RECORDING
OF A CHANGE(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

HOFMAN-BANG A/S
Hans Bekkevolds Allé 7
DK-2900 Hellerup
DANEMARK

Date of mailing (day/month/year) 08 September 2000 (08.09.00)	IMPORTANT NOTIFICATION International filing date (day/month/year) 04 February 2000 (04.02.00)
Applicant's or agent's file reference P199900132 WO	
International application No. PCT/DK00/00051	

1. The following indications appeared on record concerning:

☒ the applicant

 ☒ the inventor

 ☐ the agent

 ☐ the common representative

Name and Address RASMUSSEN, Jesper Thit Jensens Vej 37 DK-7182 Bredsted Denmark	State of Nationality DK	State of Residence DK
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☐ the person

 ☐ the name

 ☒ the address

 ☐ the nationality

 ☐ the residence

Name and Address RASMUSSEN, Jesper Thit Jensens Vej 37 DK-7182 Bredsten Denmark	State of Nationality DK	State of Residence DK
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

<input checked="" type="checkbox"/> the receiving Office	<input checked="" type="checkbox"/> the designated Offices concerned
<input type="checkbox"/> the International Searching Authority	<input type="checkbox"/> the elected Offices concerned
<input type="checkbox"/> the International Preliminary Examining Authority	<input type="checkbox"/> other:

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer C. Cupello Telephone No.: (41-22) 338.83.38
---	--

PATENT COOPERATION TREATY

**CORRECTED
VERSION****NOTIFICATION OF THE RECORDING
OF A CHANGE**(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

HOFMAN-BANG A/S
Hans Bekkevolds Allé 7
DK-2900 Hellerup
DANEMARKDate of mailing (day/month/year)
13 October 2000 (13.10.00)Applicant's or agent's file reference
P199900132 WO**IMPORTANT NOTIFICATION**International application No.
PCT/DK00/00051International filing date (day/month/year)
04 February 2000 (04.02.00)

1. The following indications appeared on record concerning:

☒ the applicant ☒ the inventor ☐ the agent ☐ the common representative

Name and Address

RASMUSSEN, Jesper
Thit Jensens Vej 37
DK-7182 Bredsted
Denmark

State of Nationality

DK

State of Residence

DK

Telephone No.

Facsimile No.

Teleprinter No.

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☐ the person ☐ the name ☒ the address ☐ the nationality ☐ the residence

Name and Address

RASMUSSEN, Jesper
Thit Jensen Vej 37
DK-7182 Bredsten
Denmark

State of Nationality

DK

State of Residence

DK

Telephone No.

Facsimile No.

Teleprinter No.

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

☒ the receiving Office ☒ the designated Offices concerned
☐ the International Searching Authority ☐ the elected Offices concerned
☐ the International Preliminary Examining Authority ☐ other:The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Authorized officer

C. Cupello

Facsimile No.: (41-22) 740.14.35

Telephone No.: (41-22) 338.83.38

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents
United States Patent and Trademark
Office
Box PCT
Washington, D.C.20231
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 18 October 2000 (18.10.00)	
International application No. PCT/DK00/00051	Applicant's or agent's file reference P199900132 WO
International filing date (day/month/year) 04 February 2000 (04.02.00)	Priority date (day/month/year) 04 February 1999 (04.02.99)
Applicant MUNCH, Gaute et al	

1. The designated Office is hereby notified of its election made:

☒

in the demand filed with the International Preliminary Examining Authority on:

21 August 2000 (21.08.00)

☐

in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was

☐

was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

<p>The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland</p> <p>Facsimile No.: (41-22) 740.14.35</p>	<p>Authorized officer</p> <p>Nestor Santesso</p> <p>Telephone No.: (41-22) 338.83.38</p>
---	--

PATENT COOPERATION TREATY

BW/ UBL

PCT

From the INTERNATIONAL BUREAU

NOTIFICATION CONCERNING SUBMISSION OR TRANSMITTAL OF PRIORITY DOCUMENT

(PCT Administrative Instructions, Section 411)

To:

HOFMAN-BANG A/S
Hans Bekkevolds Allé 7
DK-2900 Hellerup
DANEMARK

RECEIVED

17 APR. 2000

Hofman-Bang & Boutard,
Lennemann & Ree A/S

Date of mailing (day/month/year) 06 April 2000 (06.04.00)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference P199900132 WO	
International application No. PCT/DK00/00051	
International publication date (day/month/year) Not yet published	
Applicant LEGO A/S et al	International filing date (day/month/year) 04 February 2000 (04.02.00) Priority date (day/month/year) 04 February 1999 (04.02.99)

- The applicant is hereby notified of the date of receipt (except where the letters "NR" appear in the right-hand column) by the International Bureau of the priority document(s) relating to the earlier application(s) indicated below. Unless otherwise indicated by an asterisk appearing next to a date of receipt, or by the letters "NR", in the right-hand column, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).
- This updates and replaces any previously issued notification concerning submission or transmittal of priority documents.
- An asterisk (*) appearing next to a date of receipt, in the right-hand column, denotes a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b). In such a case, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.
- The letters "NR" appearing in the right-hand column denote a priority document which was not received by the International Bureau or which the applicant did not request the receiving Office to prepare and transmit to the International Bureau, as provided by Rule 17.1(a) or (b), respectively. In such a case, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

Priority date	Priority application No.	Country or regional Office or PCT receiving Office	Date of receipt of priority document
04 Febr 1999 (04.02.99)	PA 1999 00143	DK	14 Marc 2000 (14.03.00)

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. (41-22) 740.14.35

Authorized officer

Marie-José Devillard

Telephone No. (41-22) 336.83.38

Form PCT/IB/304 (July 1998)

003213733

Attorney Docket No.: 2388-797
Express Mail Label No.: ET025234443US

PATENT COOPERATION TREATY

WO 00/45924
PCT/DK00/00051

BLU/UDL

From the INTERNATIONAL BUREAU

PCT

NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

To:

HOFMAN-BANG A/S
Hans Bekkevolds Allé 7
DK-2900 Hellerup
DANEMARK

RECEIVED

18 AUG. 2000

Hofman-Bang & Boutard,
Lehmann & Klee 95

Date of mailing (day/month/year) 10 August 2000 (10.08.00)		
Applicant's or agent's file reference P199900132 WO		IMPORTANT NOTICE
International application No. PCT/DK00/00051	International filing date (day/month/year) 04 February 2000 (04.02.00)	Priority date (day/month/year) 04 February 1999 (04.02.99)
Applicant LEGO A/S et al		

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:
AU,JP,KP,KR,US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:

AE,AL,AM,AP,AT,AZ,BA,BB,BG,BR,BY,CA,CH,CN,CR,CU,CZ,DE,DK,DM,EA,EE,EP,ES,FI,GB,GD,
GE,GH,GM,HR,HU,ID,IL,IN,IS,KE,KG,KZ,LC,LK,LR,LS,LT,LU,LV,MA,MD,MG,MK,MN,MW,MX,NO,
NZ,OA,PL,PT,RO,RU,SD,SE,SG,SI,SK,SL,TJ,TM,TR,TT,TZ,UA,UG,UZ,VN,YU,ZA,ZW

The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on
10 August 2000 (10.08.00) under No. WO 00/45924

REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. (41-22) 740.14.35	Authorized officer J. Zahra Telephone No. (41-22) 338.83.38
--	---

Form PCT/IB/308 (July 1996)

3445422

PATENT COOPERATION TREATY

BLU/UDL

PCT

INFORMATION CONCERNING ELECTED
OFFICES NOTIFIED OF THEIR ELECTION

(PCT Rule 61.3)

From the INTERNATIONAL BUREAU

RECEIVED

To:

- 1 NOV. 2000

Hofman-Bang & Boutard,
Lehmann & Ree A/SHOFMAN-BANG A/S
Hans Bekkevolds Allé 7
DK-2900 Hellerup
DANEMARK

Date of mailing (day/month/year) 18 October 2000 (18.10.00)		IMPORTANT INFORMATION	
Applicant's or agent's file reference P199900132 WO			
International application No. PCT/DK00/00051	International filing date (day/month/year) 04 February 2000 (04.02.00)	Priority date (day/month/year) 04 February 1999 (04.02.99)	
Applicant LEGO A/S et al			

1. The applicant is hereby informed that the International Bureau has, according to Article 31(7), notified each of the following Offices of its election:

AP : GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW

EP : AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE

National : AU, BG, CA, CN, CZ, DE, IL, JP, KP, KR, MN, NO, NZ, PL, RO, RU, SE, SK, US

2. The following Offices have waived the requirement for the notification of their election; the notification will be sent to them by the International Bureau only upon their request:

EA : AM, AZ, BY, KG, KZ, MD, RU, TJ, TM

OA : BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG

National : AE, AL, AM, AT, AZ, BA, BB, BR, BY, CH, CR, CU, DK, DM, EE, ES, FI, GB, GD, GE, GH,
GM, HR, HU, ID, IN, IS, KE, KG, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MW, MX, PT, SD,
SG, SI, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW

3. The applicant is reminded that he must enter the "national phase" before the expiration of 30 months from the priority date before each of the Offices listed above. This must be done by paying the national fee(s) and furnishing, if prescribed, a translation of the international application (Article 39(1)(a)), as well as, where applicable, by furnishing a translation of any annexes of the international preliminary examination report (Article 36(3)(b) and Rule 74.1).

Some offices have fixed time limits expiring later than the above-mentioned time limit. For detailed information about the applicable time limits and the acts to be performed upon entry into the national phase before a particular Office, see Volume II of the PCT Applicant's Guide.

The entry into the European regional phase is postponed until 31 months from the priority date for all States designated for the purposes of obtaining a European patent.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer: Nestor Santesso
Facsimile No. (41-22) 740.14.35	Telephone No. (41-22) 338.83.38

Form PCT/IB/332 (September 1997)

3591351

Attorney Docket No.: 2388-797
Express Mail Label No.: ET025234443US

PATENT COOPERATION TREATY

**CORRECTED
VERSION****NOTIFICATION OF THE RECORDING
OF A CHANGE**(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

HOFMAN-BANG A/S
Hans Bekkevolds Allé 7
DK-2900 Hellerup
DANEMARK**RECEIVED****23 OKT. 2000**Hofman-Bang & Boutard,
Lehmann & Ree A/S

Date of mailing (day/month/year) 13 October 2000 (13.10.00)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference P199900132 WO <i>B60</i>	
International application No. PCT/DK00/00051	International filing date (day/month/year) 04 February 2000 (04.02.00)

1. The following indications appeared on record concerning:

☒ the applicant ☒ the inventor ☐ the agent ☐ the common representative

Name and Address RASMUSSEN, Jesper Thit Jensens Vej 37 DK-7182 Bredsted Denmark	State of Nationality DK	State of Residence DK
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☐ the person ☐ the name ☒ the address ☐ the nationality ☐ the residence

Name and Address RASMUSSEN, Jesper Thit Jensen Vej 37 DK-7182 Bredsten Denmark	State of Nationality DK	State of Residence DK
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

<input checked="" type="checkbox"/> the receiving Office	<input checked="" type="checkbox"/> the designated Offices concerned
<input type="checkbox"/> the International Searching Authority	<input type="checkbox"/> the elected Offices concerned
<input type="checkbox"/> the International Preliminary Examining Authority	<input type="checkbox"/> other:

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer C. Cupello Telephone No.: (41-22) 338.83.38
---	--

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)



14

Applicant's or agent's file reference P199900132 WO		FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/DK00/00051	International filing date (day/month/year) 04/02/2000	Priority date (day/month/year) 04/02/1999	
International Patent Classification (IPC) or national classification and IPC A63H17/395			
Applicant LEGO A/S et al.			


1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

 These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 21/08/2000	Date of completion of this report 18.05.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Squeri, M Telephone No. +49 89 2399 8417



INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/DK00/00051

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1-18 as originally filed

Claims, No.:

1-13 with telefax of 26/04/2001

Drawings, sheets:

1/6-6/6 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/DK00/00051

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-13
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-13
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-13
	No:	Claims	

2. Citations and explanations see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/DK00/00051

1. It has not been possible to check the validity of the claimed priority date because the priority document was supplied only in Danish and, despite the formal request from the examiner (in conformity to Rule 66.7.b PCT), the applicant has not supplied a version of the priority document in one of the three official languages of the International Preliminary Examining Authority (English, French or German).

SECTION V:

2. Although some clarity problems have been found (see Section VIII of this Report), it has been possible to establish a Report on the novelty, inventive step and industrial applicability of the subject-matter of claim 1.

A microprocessor controlled toy building element according to the preamble of claim 1 is known from the document US-A-4802879 (D1). The icons configured to illustrate patterns of movements are there not disclosed.

Therefore, claim 1 meets the requirements of Article 33.2 PCT.

In the available prior art there is no suggestion that by means of icons configured to illustrate patterns of movements it could be possible to control the program, that the toy building element is executing, in an easier manner.

Consequently, claim 1 involves also an inventive step (Article 33.3 PCT).

The subject-matter of claim 1 is industrially applicable as a toy building element (Article 33.4 PCT).

3. Claims 2-12 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.
4. In claim 13 is claimed a toy building set according to any one of the claims 1-12, which (see above) meet the requirements of Article 33 PCT. Consequently, also claim 13 is considered to meet the requirements of Article 33 PCT.

SECTION VII:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/DK00/00051

5. Contrary to the requirements of Rule 5.1.a.ii PCT, the relevant background art disclosed in the document D1 is not mentioned in the description, nor is this document identified therein.
6. Claim 2 depends from "claim 1 or 2", this is obviously wrong.

SECTION VIII:

7. The word "said" before "manoeuvring means", in line 14 of claim 1, is considered to be inappropriate since the "manoeuvring means", before this point, has been introduced only after a "for" and, consequently, they are not claimed (Guidelines PCT, Section IV, Chapter III, 4.8.a)
8. It is not clear what is meant with the wording "said icons that are signalled with representing a pattern of movement followed by the toy building element" (Article 6 PCT).

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P199900132 WO	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) FOR FURTHER ACTION	
International application No. PCT/DK00/00051	International filing date (day/month/year) 04/02/2000	Priority date (day/month/year) 04/02/1999
International Patent Classification (IPC) or national classification and IPC A63H17/395		
Applicant LEGO A/S et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 5 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 21/08/2000	Date of completion of this report 18.05.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich	Authorized officer Squeri, M 

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/DK00/00051

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1-18 as originally filed

Claims, No.:

1-13 with telefax of 26/04/2001

Drawings, sheets:

1/6-6/6 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/DK00/00051

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-13
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-13
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-13
	No:	Claims	

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/DK00/00051

1. It has not been possible to check the validity of the claimed priority date because the priority document was supplied only in Danish and, despite the formal request from the examiner (in conformity to Rule 66.7.b PCT), the applicant has not supplied a version of the priority document in one of the three official languages of the International Preliminary Examining Authority (English, French or German).

SECTION V:

2. Although some clarity problems have been found (see Section VIII of this Report), it has been possible to establish a Report on the novelty, inventive step and industrial applicability of the subject-matter of claim 1.

A microprocessor controlled toy building element according to the preamble of claim 1 is known from the document US-A-4802879 (D1). The icons configured to illustrate patterns of movements are there not disclosed.

Therefore, claim 1 meets the requirements of Article 33.2 PCT.

In the available prior art there is no suggestion that by means of icons configured to illustrate patterns of movements it could be possible to control the program, that the toy building element is executing, in an easier manner.

Consequently, claim 1 involves also an inventive step (Article 33.3 PCT).

The subject-matter of claim 1 is industrially applicable as a toy building element (Article 33.4 PCT).

3. Claims 2-12 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.
4. In claim 13 is claimed a toy building set according to any one of the claims 1-12, which (see above) meet the requirements of Article 33 PCT. Consequently, also claim 13 is considered to meet the requirements of Article 33 PCT.

SECTION VII:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/DK00/00051

5. Contrary to the requirements of Rule 5.1.a.ii PCT, the relevant background art disclosed in the document D1 is not mentioned in the description, nor is this document identified therein.
6. Claim 2 depends from "claim 1 or 2", this is obviously wrong.

SECTION VIII:

7. The word "said" before "manoeuvring means", in line 14 of claim 1, is considered to be inappropriate since the "manoeuvring means", before this point, has been introduced only after a "for" and, consequently, they are not claimed (Guidelines PCT, Section IV, Chapter III, 4.8.a)
8. It is not clear what is meant with the wording "said icons that are signalled with representing a pattern of movement followed by the toy building element" (Article 6 PCT).

AMENDED PATENT CLAIMS:

1. A microprocessor controlled toy building element
(101, 501) comprising

5

a microprocessor (102, 507) which can execute instructions in the form of a program stored in a memory (117, 509);

10 a display (104, 508) integrated in the toy building element (101, 501) and adapted to display icons representing instructions to the microprocessor (102;507);

coupling means for coupling with building elements that
15 can be moved by manoeuvring means, said manoeuvring means being controllable in response to the instructions,

c h a r a c t e r i z e d in that

20 the display (104, 508) comprises a plurality of icons (204, 205, 206, 207, 208) that are configured to illustrate patterns of movement, and which icons can be activated by a user for programming the microprocessor, and by

25

signalling with icons from the plurality of icons, said icons that are signalled with representing a pattern of movement followed by the toy building element.

30

2. A microprocessor controlled toy building element according to claim 1 or 2, c h a r a c t e r i z e d in

that a type of icons (207, 208) is configured to illustrate modifications of patterns of movement.

3. A microprocessor controlled toy building element according to claim 1 or 2, characterized in that the toy comprises means for generating a first set of instructions comprising parameters upon activation of a first type of icons (204, 205, 206), which instructions and/or parameters may be modified by activation of a second type of icons (207, 208).

4. A microprocessor controlled toy building element according to any one of claims 1-3, characterized in that the microprocessor (102, 507) is adapted to receive signals from electrical and/or electronic units.

5. A microprocessor controlled toy building element according to claim 4, characterized in that a first group of rules is conditioned by a first group of signals, and that a second group of rules (R1-R6) is conditioned by a second group of signals.

6. A microprocessor controlled toy building element according to any one of claims 1-5, characterized in that instructions corresponding to one icon implement one rule by controlling the manoeuvring means in response to signals from electrical and/or electronic units.

7. A microprocessor controlled toy building element according to any one of claims 1-6, characterized in that the microprocessor executes rules (R1-R6) in the form of instructions which control units,

said rules being conditioned by a plurality of signals,

said rules being arranged in an at least partly priori-
5 tized order,

said prioritized order indicating which one of several
rules is to be allowed to control a unit,

10 said order being arranged according to the signals by
which they are conditioned.

8. A microprocessor controlled toy building element ac-
cording to any one of claims 1-7, c h a r a c t e r -
15 i z e d in that the toy comprises keys (113, 114, 115)
integrated in the toy, said keys being capable of acti-
vating the icons.

9. A microprocessor controlled toy building element ac-
20 cording to any one of claims 1-8, c h a r a c t e r -
i z e d in that the toy comprises communications means
(505, 504) for receiving commands which can be converted
into a program that can be executed by the microproces-
sor.

25 10. A microprocessor controlled toy building element ac-
cording to any one of claims 1-9, c h a r a c t e r -
i z e d in that the toy comprises communications means
for transmission (505, 504) of commands.

30 11. A microprocessor controlled toy building element ac-
cording to any one of claims 1-10, c h a r a c t e r -

i z e d in that the toy comprises communications means (54) for transferring information via a light guide (503).

5 12. A microprocessor controlled toy building element according to any one of claims 1-11, c h a r a c t e r -
i z e d in that the toy comprises an elongated light
guide (503), through which visible light may be transmit-
ted in its longitudinal direction, said light guide being
10 adapted to allow part of the light transmitted to escape
through its sides.

13. A toy building set according to any one of claims 1-
12, c h a r a c t e r i z e d by comprising toy build-
15 ing elements with coupling means for mutual coupling.

PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

097890722

International Application No. PCT/DK 00/00051

04 FEBRUARY 2000

International Filing Date 04 FEBRUARY 2000

Trademark Office

PCT-International Application

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference
(if desired) (12 characters maximum)

P199900132 WO

Box No. I TITLE OF INVENTION

A microprocessor controlled toy building element with visual programming

Box No. II APPLICANT

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

LEGO A/S
Aastvej 1
DK-7190 Billund
DENMARK

☐ This person is also inventor.

Telephone No.

Facsimile No.

Teleprinter No.

State (that is, country) of nationality:
DK Denmark

State (that is, country) of residence:
DK Denmark

This person is applicant
for the purposes of:

☐ all designated
States

☐ all designated States except
the United States of America

☐ the United States
of America only

☒ the States indicated in
the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

INTERLEGO AG
Neuhofstrasse 21
CH-6340 Baar
SWITZERLAND

This person is:

☒ applicant only

☐ applicant and inventor

☐ inventor only (If this check-box
is marked, do not fill in below.)

State (that is, country) of nationality:
CH Switzerland

State (that is, country) of residence:
CH Switzerland

This person is applicant
for the purposes of:

☐ all designated
States

☐ all designated States except
the United States of America

☐ the United States
of America only

☒ the States indicated in
the Supplemental Box

☒ Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf
of the applicant(s) before the competent International Authorities as:

☒ agent

☐ common representative

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

Hofman-Bang A/S
Hans Bekkevolds Allé 7
DK-2900 Hellerup
DENMARK

Telephone No.

+45 39 48 80 00

Facsimile No.

+45 39 48 80 80

Teleprinter No.

19085 hbbdk

☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

CONFIRMATION COPY

Continuation of Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

If none of the following sub-boxes is used, this sheet should not be included in the request.

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

MUNCH, Gaute
Granslevbyvej 19
DK-8870 Langå
DENMARK

This person is:

- ☐ applicant only
☒ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

DK Denmark

State (that is, country) of residence:

DK Denmark

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

RASMUSSEN, Jesper
Thit Jensens Vej 37
DK-7182 Bredsted
DENMARK

This person is:

- ☐ applicant only
☒ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

DK Denmark

State (that is, country) of residence:

DK Denmark

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

- ☐ applicant only
☐ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

- ☐ applicant only
☐ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

☐ Further applicants and/or (further) inventors are indicated on another continuation sheet.

Box No.V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes, at least one must be marked):

Regional Patent

- ☒ **AP ARIPO Patent:** GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, SD Sudan, SL Sierra Leone, SZ Swaziland, TZ United Republic of Tanzania, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☒ **EA Eurasian Patent:** AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ **EP European Patent:** AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☒ **OA OAPI Patent:** BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, GW Guinea-Bissau, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line)

National Patent (if other kind of protection or treatment desired, specify on dotted line):

- | | |
|---|---|
| <input checked="" type="checkbox"/> AE United Arab Emirates | <input checked="" type="checkbox"/> LR Liberia |
| <input checked="" type="checkbox"/> AL Albania | <input checked="" type="checkbox"/> LS Lesotho |
| <input checked="" type="checkbox"/> AM Armenia | <input checked="" type="checkbox"/> LT Lithuania |
| <input checked="" type="checkbox"/> AT Austria and Utility Model | <input checked="" type="checkbox"/> LU Luxembourg |
| <input checked="" type="checkbox"/> AU Australia | <input checked="" type="checkbox"/> LV Latvia |
| <input checked="" type="checkbox"/> AZ Azerbaijan | <input checked="" type="checkbox"/> MA Morocco |
| <input checked="" type="checkbox"/> BA Bosnia and Herzegovina | <input checked="" type="checkbox"/> MD Republic of Moldova |
| <input checked="" type="checkbox"/> BB Barbados | <input checked="" type="checkbox"/> MG Madagascar |
| <input checked="" type="checkbox"/> BG Bulgaria | <input checked="" type="checkbox"/> MK The former Yugoslav Republic of Macedonia |
| <input checked="" type="checkbox"/> BR Brazil | <input checked="" type="checkbox"/> MN Mongolia |
| <input checked="" type="checkbox"/> BY Belarus | <input checked="" type="checkbox"/> MW Malawi |
| <input checked="" type="checkbox"/> CA Canada | <input checked="" type="checkbox"/> MX Mexico |
| <input checked="" type="checkbox"/> CH and LI Switzerland and Liechtenstein | <input checked="" type="checkbox"/> NO Norway |
| <input checked="" type="checkbox"/> CN China | <input checked="" type="checkbox"/> NZ New Zealand |
| <input checked="" type="checkbox"/> CR Costa Rica | <input checked="" type="checkbox"/> PL Poland |
| <input checked="" type="checkbox"/> CU Cuba | <input checked="" type="checkbox"/> PT Portugal |
| <input checked="" type="checkbox"/> CZ Czech Republic and Utility Model | <input checked="" type="checkbox"/> RO Romania |
| <input checked="" type="checkbox"/> DE Germany and Utility Model | <input checked="" type="checkbox"/> RU Russian Federation |
| <input checked="" type="checkbox"/> DK Denmark and Utility Model | <input checked="" type="checkbox"/> SD Sudan |
| <input checked="" type="checkbox"/> DM Dominica | <input checked="" type="checkbox"/> SE Sweden |
| <input checked="" type="checkbox"/> EE Estonia and Utility Model | <input checked="" type="checkbox"/> SG Singapore |
| <input checked="" type="checkbox"/> ES Spain | <input checked="" type="checkbox"/> SI Slovenia |
| <input checked="" type="checkbox"/> FI Finland and Utility Model | <input checked="" type="checkbox"/> SK Slovakia and Utility Model |
| <input checked="" type="checkbox"/> GB United Kingdom | <input checked="" type="checkbox"/> SL Sierra Leone |
| <input checked="" type="checkbox"/> GD Grenada | <input checked="" type="checkbox"/> TJ Tajikistan |
| <input checked="" type="checkbox"/> GE Georgia | <input checked="" type="checkbox"/> TM Turkmenistan |
| <input checked="" type="checkbox"/> GH Ghana | <input checked="" type="checkbox"/> TR Turkey |
| <input checked="" type="checkbox"/> GM Gambia | <input checked="" type="checkbox"/> TT Trinidad and Tobago |
| <input checked="" type="checkbox"/> HR Croatia | <input checked="" type="checkbox"/> TZ United Republic of Tanzania |
| <input checked="" type="checkbox"/> HU Hungary | <input checked="" type="checkbox"/> UA Ukraine |
| <input checked="" type="checkbox"/> ID Indonesia | <input checked="" type="checkbox"/> UG Uganda |
| <input checked="" type="checkbox"/> IL Israel | <input checked="" type="checkbox"/> US United States of America |
| <input checked="" type="checkbox"/> IN India | <input checked="" type="checkbox"/> UZ Uzbekistan |
| <input checked="" type="checkbox"/> IS Iceland | <input checked="" type="checkbox"/> VN Viet Nam |
| <input checked="" type="checkbox"/> JP Japan | <input checked="" type="checkbox"/> YU Yugoslavia |
| <input checked="" type="checkbox"/> KE Kenya | <input checked="" type="checkbox"/> ZA South Africa |
| <input checked="" type="checkbox"/> KG Kyrgyzstan | <input checked="" type="checkbox"/> ZW Zimbabwe |
| <input checked="" type="checkbox"/> KP Democratic People's Republic of Korea | |
| <input checked="" type="checkbox"/> KR Republic of Korea | |
| <input checked="" type="checkbox"/> KZ Kazakhstan | |
| <input checked="" type="checkbox"/> LC Saint Lucia | |
| <input checked="" type="checkbox"/> LK Sri Lanka | |

Check-boxes reserved for designating States which have become party to the PCT after issuance of this sheet:

- ☐
- ☐

Precautionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation (including fees) must reach the receiving Office within the 15-month time limit.)

Supplemental Box

If the Supplemental Box is not used, this sheet should not be included in the request.

1. If, in any of the Boxes, the space is insufficient to furnish all the information: in such case, write "Continuation of Box No. ..." (indicate the number of the Box) and furnish the information in the same manner as required according to the captions of the Box in which the space was insufficient, in particular:
- (i) if more than two persons are involved as applicants and/or inventors and no "continuation sheet" is available: in such case, write "Continuation of Box No. III" and indicate for each additional person the same type of information as required in Box No. III. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below;
 - (ii) if, in Box No. II or in any of the sub-boxes of Box No. III, the indication "the States indicated in the Supplemental Box" is checked: in such case, write "Continuation of Box No. II" or "Continuation of Box No. III" or "Continuation of Boxes No. II and No. III" (as the case may be), indicate the name of the applicant(s) involved and, next to (each) such name, the State(s) (and/or, where applicable, ARIPO, Eurasian, European or OAPI patent) for the purposes of which the named person is applicant;
 - (iii) if, in Box No. II or in any of the sub-boxes of Box No. III, the inventor or the inventor/applicant is not inventor for the purposes of all designated States or for the purposes of the United States of America: in such case, write "Continuation of Box No. II" or "Continuation of Box No. III" or "Continuation of Boxes No. II and No. III" (as the case may be), indicate the name of the inventor(s) and, next to (each) such name, the State(s) (and/or, where applicable, ARIPO, Eurasian, European or OAPI patent) for the purposes of which the named person is inventor;
 - (iv) if, in addition to the agent(s) indicated in Box No. IV, there are further agents: in such case, write "Continuation of Box No. IV" and indicate for each further agent the same type of information as required in Box No. IV;
 - (v) if, in Box No. V, the name of any State (or OAPI) is accompanied by the indication "patent of addition," or "certificate of addition," or if, in Box No. V, the name of the United States of America is accompanied by an indication "continuation" or "continuation-in-part": in such case, write "Continuation of Box No. V" and the name of each State involved (or OAPI), and after the name of each such State (or OAPI), the number of the parent title or parent application and the date of grant of the parent title or filing of the parent application;
 - (vi) if, in Box No. VI, there are more than three earlier applications whose priority is claimed: in such case, write "Continuation of Box No. VI" and indicate for each additional earlier application the same type of information as required in Box No. VI;
 - (vii) if, in Box No. VI, the earlier application is an ARIPO application: in such case, write "Continuation of Box No. VI", specify the number of the item corresponding to that earlier application and indicate at least one country party to the Paris Convention for the Protection of Industrial Property or one Member of the World Trade Organization for which that earlier application was filed.
2. If, with regard to the precautionary designation statement contained in Box No. V, the applicant wishes to exclude any State(s) from the scope of that statement: in such case, write "Designation(s) excluded from precautionary designation statement" and indicate the name or two-letter code of each State so excluded.
3. If the applicant claims, in respect of any designated Office, the benefits of provisions of the national law concerning non-prejudicial disclosures or exceptions to lack of novelty: in such case, write "Statement concerning non-prejudicial disclosures or exceptions to lack of novelty" and furnish that statement below.

Continuation of Box II:

LEGO A/S: All designated states except:
AU, BR, CA, CN, GB, IE, IN, MX, NZ, SG & US

Continuation of Box III:

INTERLEGO AG: AU, BR, CA, CN, GB, IE, IN, MX, NZ & SG

RO/DK 8 MARCH 2000

Box No. VI PRIORITY CLAIM				
<input type="checkbox"/> Further priority claim indicated in the Supplemental Box.				
Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country	regional application: regional Office	international application: receiving Office
item (1)				
04.02.1999	PA 199900143	Denmark		
item (2)				
item (3)				

☐ The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office) identified above as item(s):

* Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA)
(if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):

Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority):

ISA / SE

Date (day/month/year)

05.02.1999

Number

DK 99/00028

Country (or regional Office)

Denmark

Box No. VIII CHECK LIST; LANGUAGE OF FILING

This international application contains the following number of sheets:

request : 5
description (excluding sequence listing part) : 16
claims : 4
abstract : 1
drawings : 6
sequence listing part of description :
Total number of sheets : 32

This international application is accompanied by the item(s) marked below:

1. ☒ fee calculation sheet
2. ☐ separate signed power of attorney
3. ☐ copy of general power of attorney; reference number, if any:
4. ☐ statement explaining lack of signature
5. ☐ priority document(s) identified in Box No. VI as item(s):
6. ☐ translation of international application into (language):
7. ☐ separate indications concerning deposited microorganism or other biological material
8. ☐ nucleotide and/or amino acid sequence listing in computer readable form
9. ☒ other (specify): DK 99/00028

Figure of the drawings which should accompany the abstract:

2

Language of filing of the international application:

Danish

Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

INTERLECO A/S

INTERLECO AG

Brian Sørensen
General Counsel

Sven Sanvig Bach
General Manager

Gaute Munch

Helle S. Kaspersen
Corporate Counsel

Peter Bolli
Vice-President

Jesper Rasmussen
Jesper Rasmussen

For receiving Office use only

1. Date of actual receipt of the purported international application: RO/DK 4 FEBRUARY 2000 (04.02.00)	2. Drawings: <input type="checkbox"/> received: <input type="checkbox"/> not received:
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:	
4. Date of timely receipt of the required corrections under PCT Article 11(2):	
5. International Searching Authority (if two or more are competent): ISA / SE	
6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid.	

For International Bureau use only

Date of receipt of the record copy by the International Bureau:

23 FEBRUARY 2000 (23.02.00)

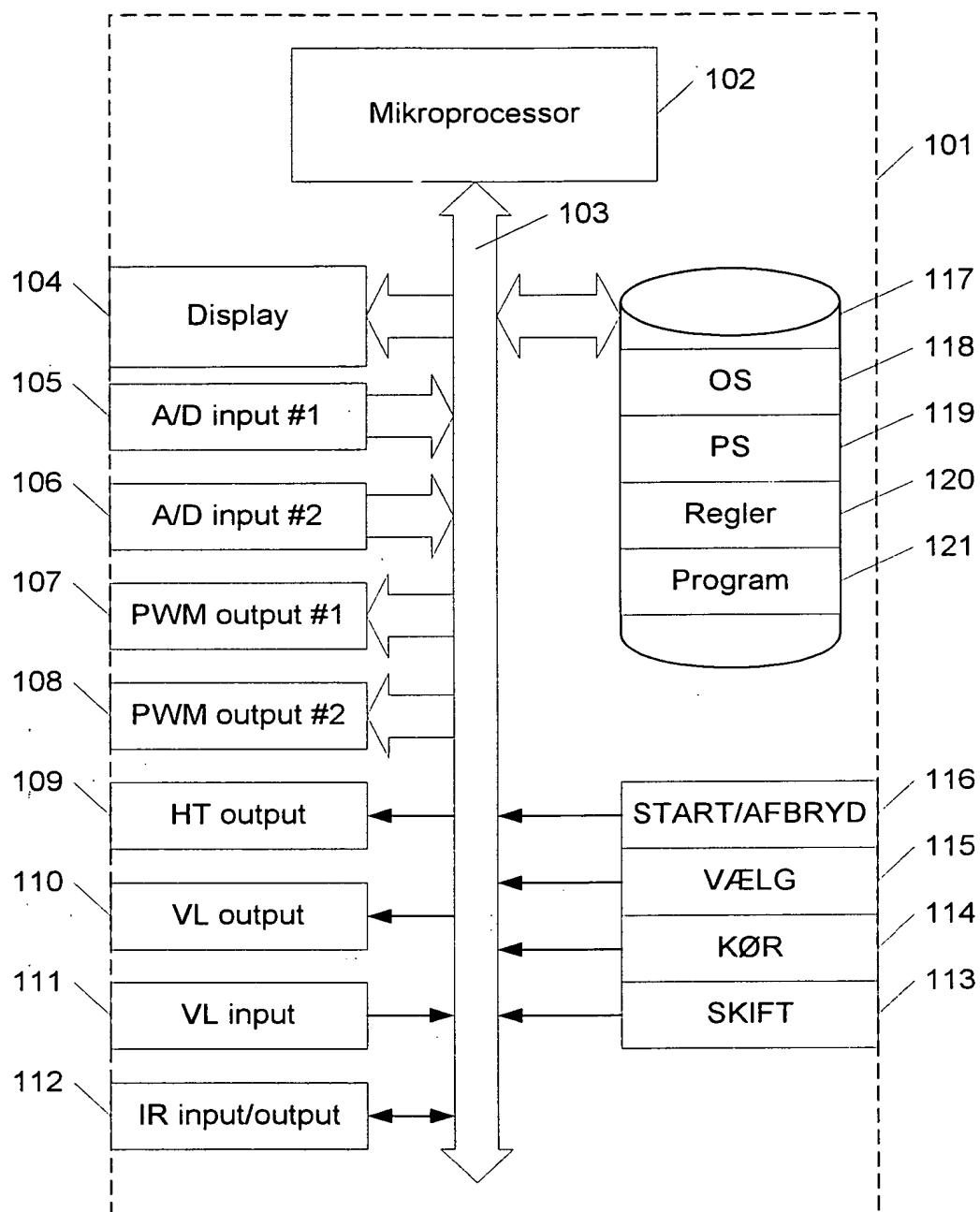


Fig. 1

2/6

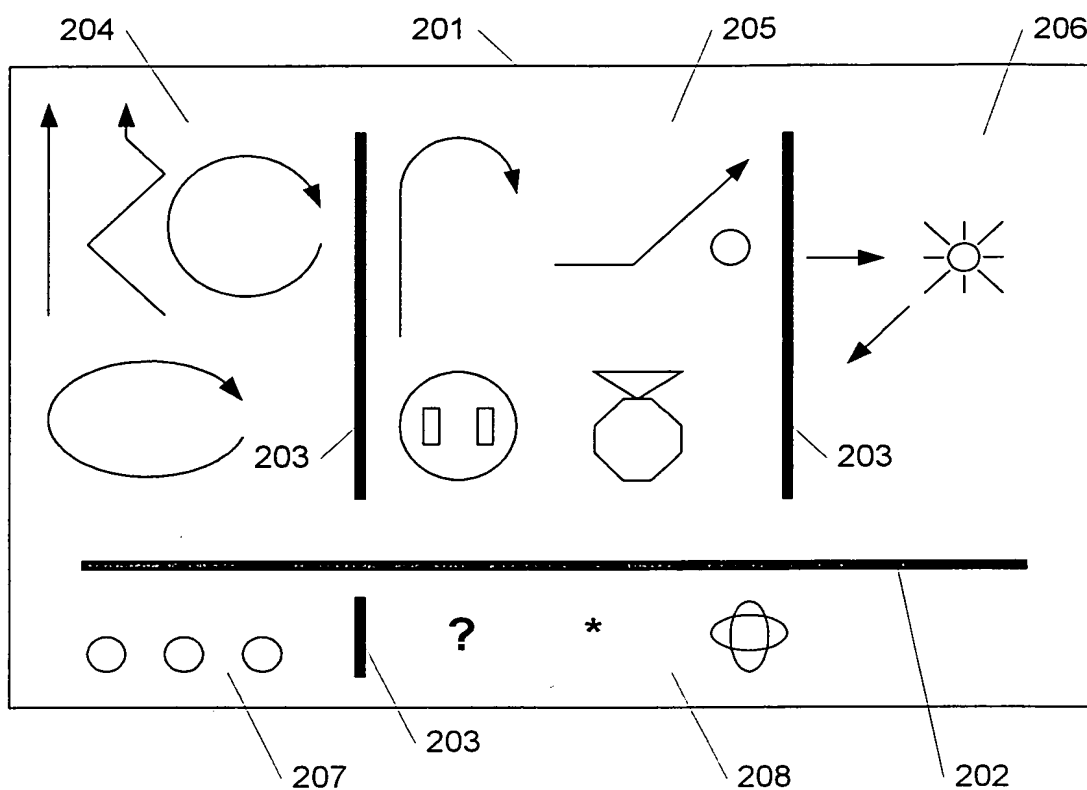


Fig. 2

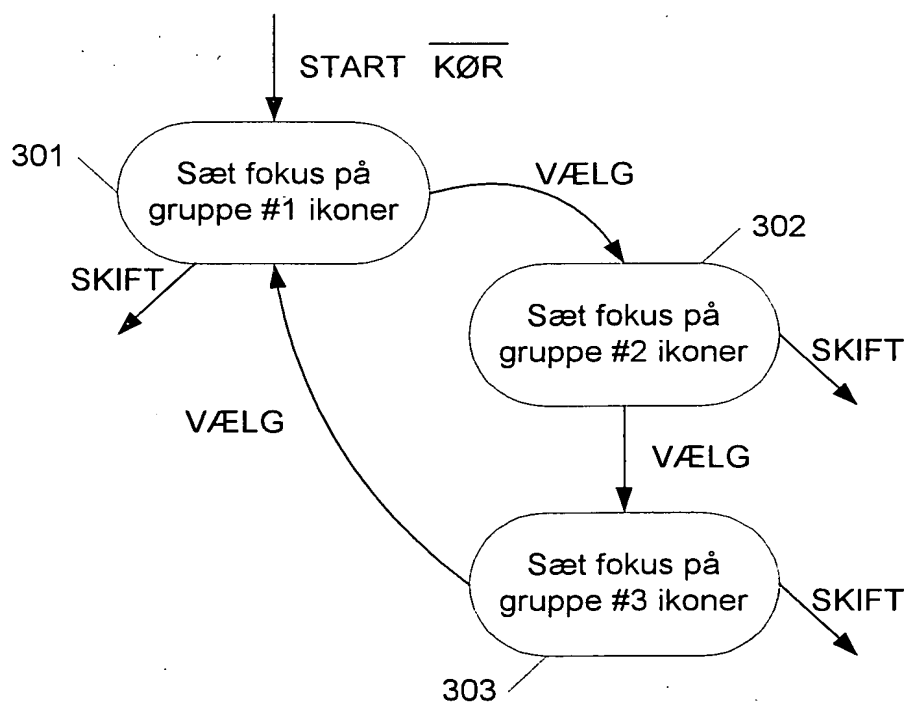


Fig. 3a

3/6

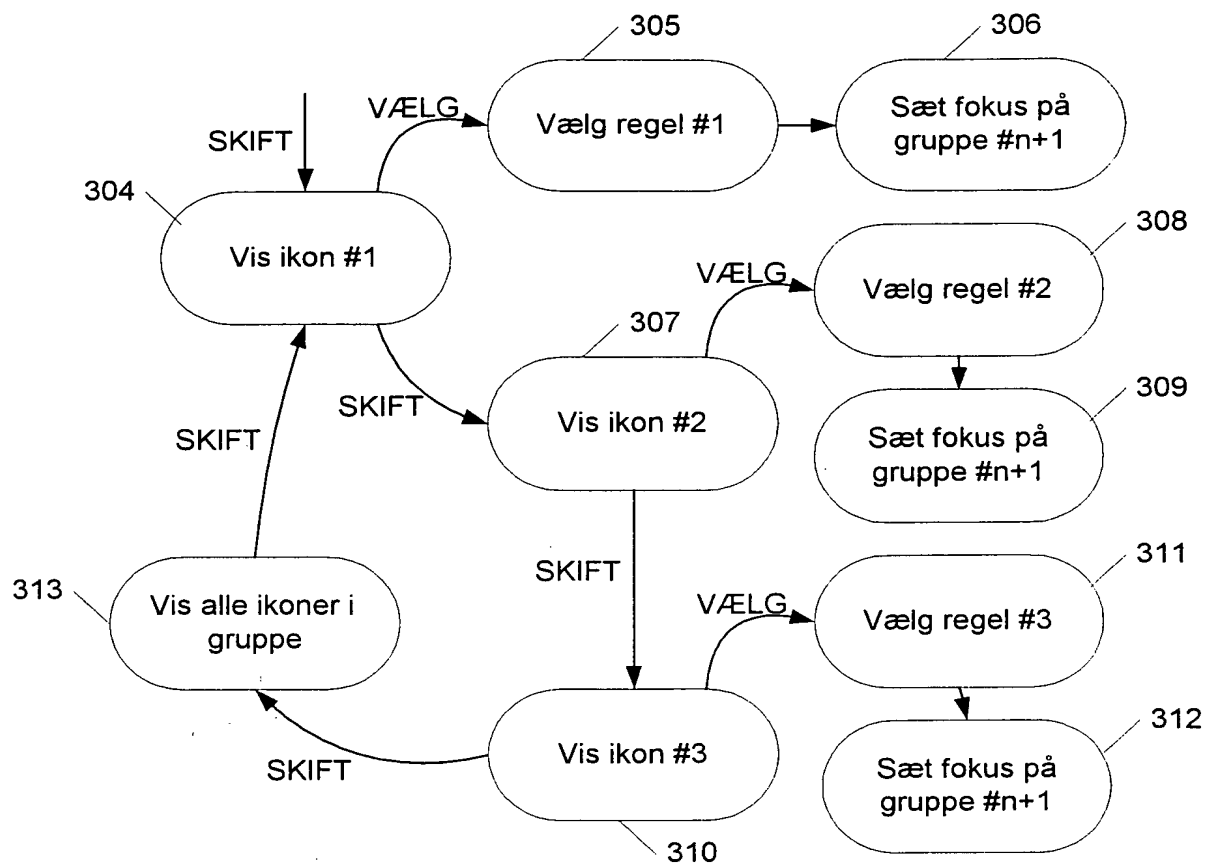


Fig. 3b

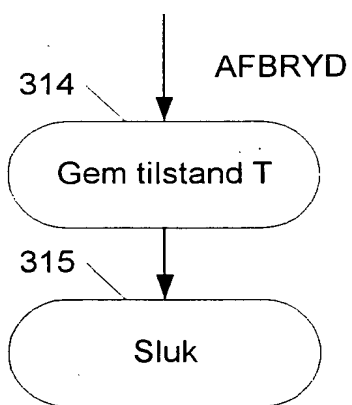


Fig. 3c

4/6

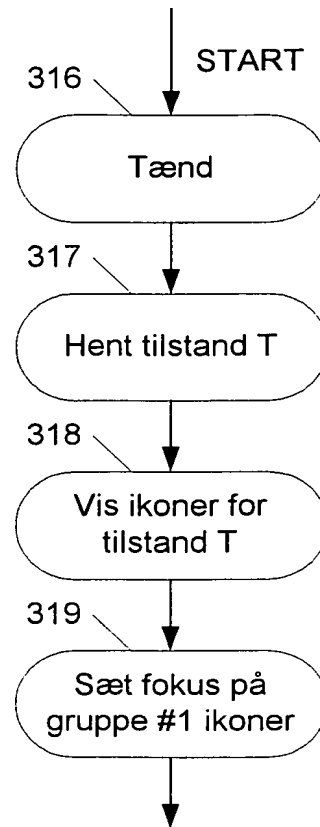


Fig. 3d

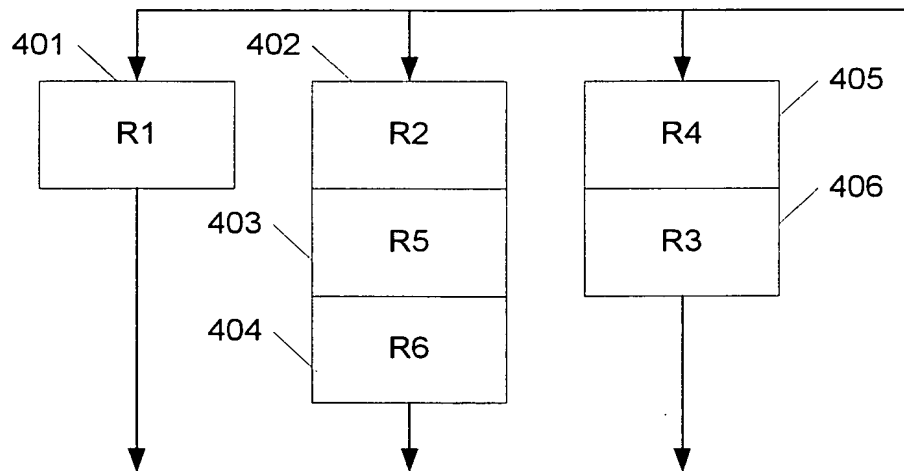


Fig. 4

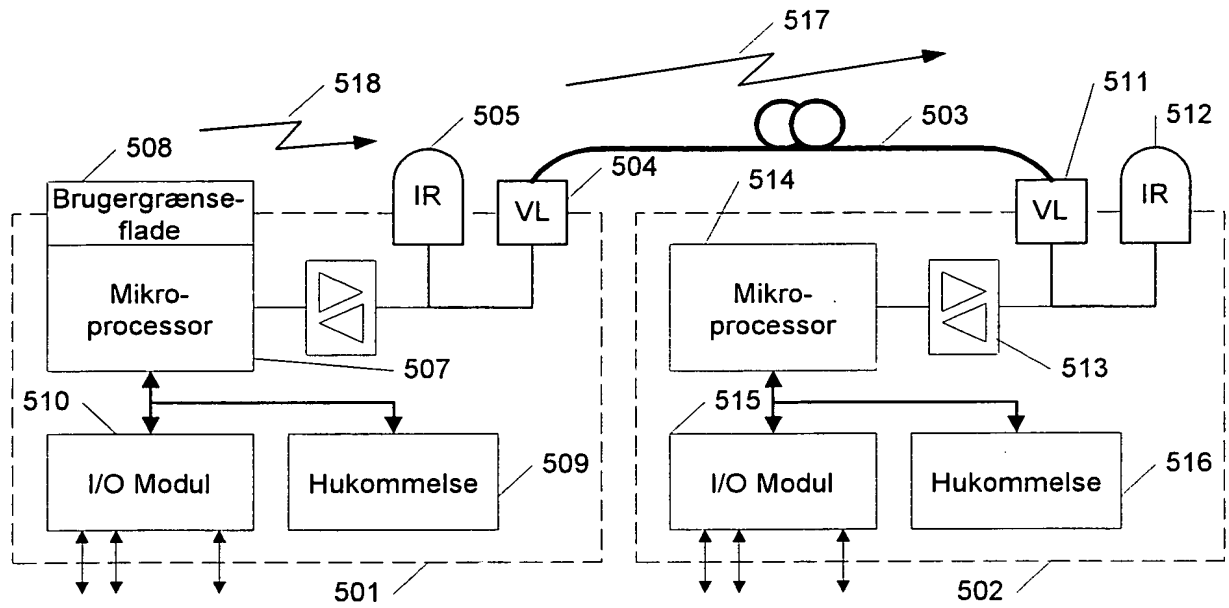


Fig. 5

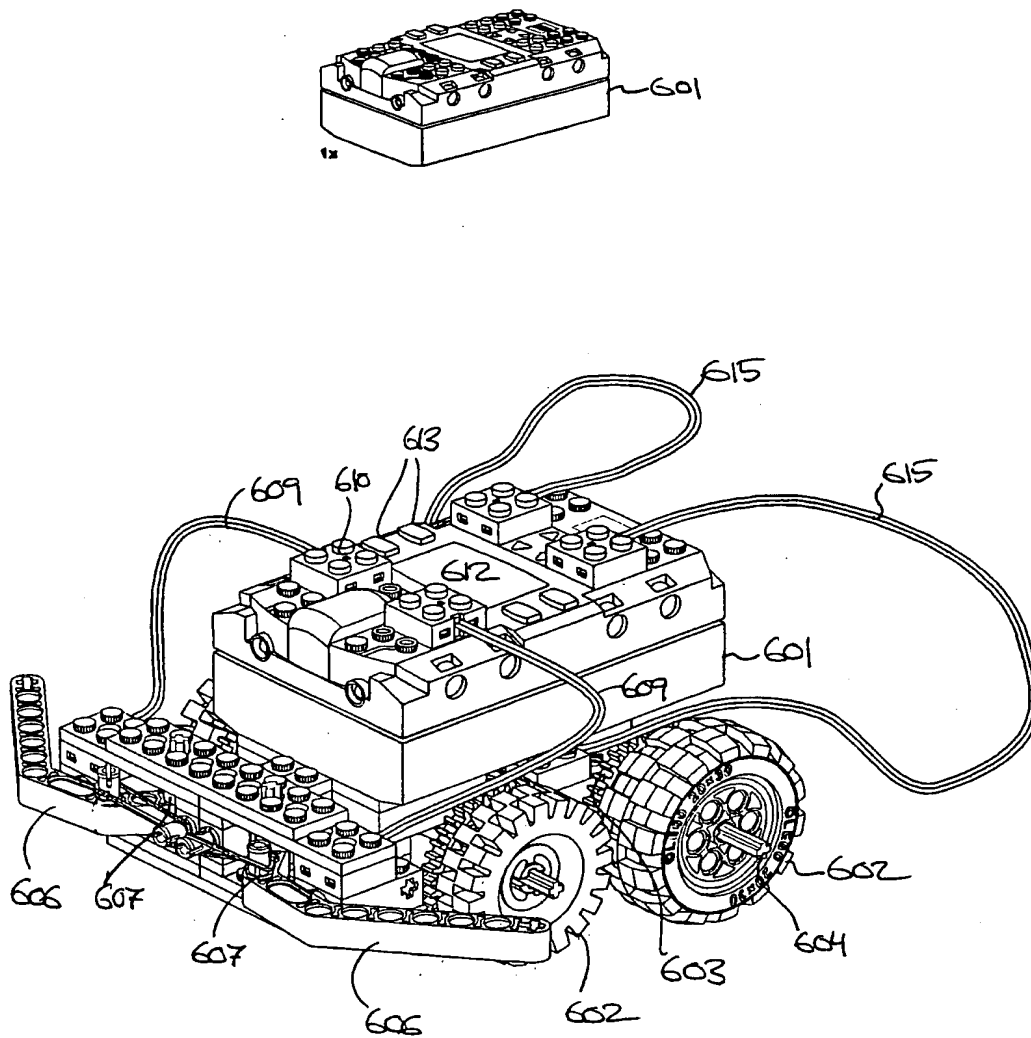


Fig. 6

Mikroprocessorstyret legetøjsbyggeelement med visuel programmering.

Denne opfindelse angår et mikroprocessorstyret legetøjs-
5 byggeelement omfattende en mikroprocessor, der kan udføre
instruktioner i form af et program lagret i en hukommel-
se; et display integreret i legetøjet; koblingsmidler for
sammenkobling med byggeelementer, der kan bevæges ved
hjælp af manøvreorganer, hvor manøvreorganerne kan styres
10 i afhængighed af instruktionerne.

I forbindelse med udviklingen af små, avancerede og rela-
tivt billige mikroprocessorer, er det blevet attraktivt
at benytte disse i mange forskellige konsumentprodukter -
herunder legetøj. Generelt set er udviklingen af legetøj
15 gået fra simple funktioner som afspilning af lyde i duk-
ker, udførelse af simple bevægemønstre i robotter osv.
mod udvikling af legetøj med avancerede handlingsmønstre.
Sådanne handlingsmønstre kendes under det engelsksprogede
begreb 'behavior'. De avancerede handlingsmønstre kan
20 genkendes af et barn, der leger med legetøjet og give
indtryk af en slags personlighed. Specielt i forbindelse
med konstruktionslegetøj er der mange muligheder for at
give legetøjet en 'behavior' ved kombinere programtrin
til et mikroprocessorstyret legetøjsbyggeelement med en
25 selvbygget mekanisk konstruktion.

Sådant programmerbart konstruktionslegetøj kendes fra
produktet ROBOTICS INVENTION SYSTEM fra LEGO MINDSTORMS,
som er et legetøj, som ved hjælp af en computer kan pro-
grammeres til at detektere en række fysiske signaler og
30 til at reagere på disse signaler ved at iværksætte fysi-
ske handlinger. Legetøjet kan for eksempel indgå som en
komponent i et køretøj ved at kombinere legetøjet med an-

CONFIRMATION COPY

dre legetøjsselementer, for eksempel motorer, hjul, kollisionsdetektorer og lysdetektorer.

WO 90/02983 angår et robotlegetøjsselement, der styres af en mikroprocessor og som kan programmeres via et indbygget tastatur. Robotlegetøjsselementet kan bevæge sig efter
5 bevægelsesmønstre og reagere på eksterne påvirkninger.

US 5,724,074 er et eksempel på et legetøjsselement, der kan programmeres. Legetøjsselementet kan programmeres fra en ekstern computer ved hjælp af en grafisk brugergrænse-
10 flade.

De ovennævnte principper til programmering af legetøjsselementer er imidlertid uhensigtsmæssige til anvendelse i mikroprocessorstyrede legetøjsbyggelementer. Specielt når de mikroprocessorstyrede legetøjsbyggelementer kan
15 kobles til andre byggelementer, så der dannes en konstruktion, som kan udføre et bevægelsesmønster, der afhænger dels af konstruktionen og dels af det program det mikroprocessorstyrede legetøjsbyggelement udfører. I en sådan situation vil en ændring af konstruktionen efter at
20 denne er programmeret, kunne resultere i en konstruktion, der ikke fungerer. Dette virker indlysende for voksne, men for børn der leger på en intuitiv - og til dels ustruktureret - måde, vil dette ikke desto mindre være en typisk situation. Det kendte legetøj kan ikke håndtere
25 sådanne situationer på en tilfredsstillende måde.

I lyset af den kendte teknik på området er det et problem, at programmerings- og kontrolfaciliteterne for mikroprocessorstyrede legetøjsbyggelementer er utilstrækkelige.

30 Det er dermed et formål med opfindelsen, at tilvejebringe forbedrede programmerings- og kontrolfaciliteter for sådanne mikroprocessorstyrede legetøjsbyggelementer.

Dette opnås, når det indledningsvis nævnte mikroprocessorstyrede legetøjsbyggeelement er kendetegnet ved at displayet omfatter et antal ikoner, som hver især repræsenterer instruktioner til mikroprocessoren, og som kan
5 aktiveres af en bruger for programmering af mikroprocessoren og at der signaleres med et første af antallet af ikoner, hvor det første ikon repræsenterer instruktioner, som mikroprocessoren er i gang med at udføre.

Dermed opnås det at brugeren af legetøjet får en indikation af hvilke instruktioner, regler eller programtrin
10 som mikroprocessoren er programmeret til at udføre - og udfører mens der signaleres med ikonet. Dette gør det nemt for barnet at prøve sig frem og få hjælp til at finde eventuelle fejl i programmet eller i konstruktionen.

15 Det er således muligt at programmere et legetøjselement på simpel vis. Det er endvidere muligt at få legetøjselementet til at udføre avancerede funktioner baseret på få og intuitive aktiveringer fra en bruger.

I det følgende vil en foretrukken udførelsesform for opfindelsen blive beskrevet under henvisning til tegningen,
20 hvor

fig. 1 viser et blokdiagram for et programmerbart legetøjselement,

fig. 2 viser et display på et legetøjselement,

25 fig. 3a viser et første diagram for en tilstandsmaskine for visuel programmering af et legetøjselement,

fig. 3b viser et andet diagram for en tilstandsmaskine for visuel programmering af et legetøjselement,

30 fig. 3c viser et tredje diagram for afbrydelse af en tilstandsmaskine,

fig. 3d viser et fjerde diagram for start af en tilstandsmaskine,

fig. 4 viser parallel og sekventiel afvikling af programmer,

- 5 fig. 5 viser et første og et andet legetøjsselement, hvor det første legetøjsselement kan overføre data til det andet legetøjsselement; og

fig. 6 viser en køretøjskonstruktion omfattende et mikroprocessorstyret legetøjsbyggeelement ifølge opfindelsen
10 koblet sammen med almindeligt kendte legetøjsbyggeelementer.

Fig. 1 viser et blokdiagram for et programmerbart legetøjsselement. Legetøjsselementet 101 omfatter en række elektroniske midler for programmering af legetøjsselementet således, at det kan påvirke elektroniske enheder (for eksempel motorer) i afhængighed af signaler opsamlet fra forskellige elektroniske sensorer (for eksempel elektriske kontakter).
15

Dermed kan legetøjsselementet bringes til at udføre avancerede funktioner som for eksempel hændelsesstyret bevægelse, under forudsætning af at legetøjsselementet kombineres med de elektroniske enheder/sensorer på passende vis.
20

Legetøjsselementet 101 omfatter en mikroprocessor 102, der er forbundet til en række enheder via en kommunikationsbus 103. Via kommunikationsbussen 103 kan mikroprocessor 102 modtage data fra to A/D omsættere 'A/D input #1' 105 og 'A/D input #2' 106. A/D omsætterne kan opsamle diskrete multibit signaler eller simple binære signaler. Endvidere er A/D omsætterne indrettet til at kunne detektere passive værdier som for eksempel ohmsk modstand.
25
30

Mikroprocessoren 102 kan styre elektroniske enheder som for eksempel en elektromotor (ikke vist) via et sæt terminaler 'PWM output #1' 107 og 'PWM output #2' 108. I en foretrukken udførelsesform for opfindelsen styres de elektroniske enheder af et pulsbreddemoduleret signal.

Endvidere kan legetøjsselementet afgive lydsignaler eller lydsekvenser ved at styre en lyd giver 109, for eksempel en højttaler eller piezoelektrisk enhed.

Via lyskilden 'VL output' 110 kan legetøjsselementet afgive lyssignaler. Disse lyssignaler kan afgives ved hjælp af lysdioder. Lysdioderne kan for eksempel være indrettet til at indikere forskellige tilstande for legetøjsselementet og de elektroniske enheder/sensorer. Endvidere kan lyssignalerne benyttes som kommunikationssignaler til andre legetøjsselementer af en tilsvarende type. Lyssignalerne kan for eksempel benyttes til at overføre data til et andet legetøjsselement via en lysleder.

Via lysdetektoren 'VL input' 111 kan legetøjsselementet modtage lyssignaler. Disse lyssignaler kan blandt andet bruges til at detektere intensiteten af lyset i det rum legetøjsselementet befinder sig i. Lyssignalerne kan alternativt modtages via en lysleder og repræsentere data fra et andet legetøjsselement eller en personlig computer. Samme lysdetektor kan således have funktion for at kommunikere via en lysleder og for at fungere som lyssensor for detektering af intensiteten af lyset i det rum legetøjsselementet befinder sig i.

I en foretrukken udførelsesform er 'VL input' 111 indrettet til valgfrit enten at kommunikere via en lysleder eller alternativt, at detektere intensiteten af lyset i det rum legetøjsselementet befinder sig i.

Via den infrarøde lysdetektor 'IR input/output' 112 kan legetøjsselementet overføre data til andre legetøjsselementer eller modtage data fra andre legetøjsselementer eller for eksempel en personlig computer.

- 5 Mikroprocessoren 102 benytter en kommunikationsprotokol for modtagelse eller afsendelse af data.

Displayet 104 og tasterne 'skift' 113, 'kør' 114, 'vælg' 115 og 'start/afbryd' 116 udgør en brugergrænseflade for betjening/programmering af legetøjsselementet. I en fore-
10 trukken udførelsesform er displayet et LCD display, der kan vise en række bestemte ikoner eller symboler. Symbolernes fremtoning på displayet kan styres individuelt, for eksempel kan et ikon være synligt, være usynligt og bringes til at blinke.

- 15 Ved at påvirke tasterne kan legetøjsselementet programmeres samtidig med, at displayet giver en tilbagemelding til en bruger, om det program der er ved at blive genereret eller udført. Dette vil blive beskrevet nærmere i det følgende. Idet brugergrænsefladen omfatter et begrænset
20 antal elementer (det vil sige et begrænset antal ikoner og taster), opnås det at et barn, der skal lege med legetøjet hurtigt vil lære at betjene det.

Legetøjsselementet omfatter også en hukommelse 117 i form af RAM og ROM. Hukommelsen indeholder et operativsystem
25 'OS' 118 for styring af mikroprocessorens basale funktioner, en programstyring 'PS' 119, der kan styre afvikling af brugerspecificerede programmer, et antal regler 120, hvor hver regel består af et antal bestemte instruktioner til mikroprocessoren og et program 121 i RAM, som udnytter
30 de bestemte regler.

I en foretrukken udførelsesform er legetøjsselementet baseret på en såkaldt single chip processor, der omfatter et

antal ind- og udgange, hukommelse og en mikroprocessor i et enkelt integreret kredsløb.

I en foretrukken udførelsesform omfatter legetøjsselementet lysdioder, der kan angive omløbsretning for tilslut-

5 tede motorer.

I endnu en udførelsesform omfatter legetøjsselementet indbyggede manøvreorganer i form af f.eks. en eller flere motorer med udtag i form af aksler, der drives af motorerne eller i form af koblingshuller med midler til at

10 optage en del af en aksel og drive denne aksel rundt.

Fig. 2 viser et display på et legetøjsselement. Displayet 201 er indrettet til at vise et antal bestemte ikoner og er vist i en tilstand, hvor alle ikoner er gjort synlige. Ikonerne er inddelt med vandrette og lodrette bjælker 202

15 henholdsvis 203 i et antal grupper 204, 205, 206, 207 og 208 efter deres funktion.

Ikonerne kan for eksempel være udformet til at illustrere mulige bevægelsesmønstre for et køretøj. Et køretøj kan for eksempel konstrueres ved at kombinere legetøjsselementet med to motorer, der kan drive et hjulsæt i højre hen-

20 holdtvis venstre side af et køretøj. Derved kan køretøjet styres til at køre fremad, baglæns, til venstre og til højre. Endvidere kan køretøjet omfatte trykfølsomme kontakter for detektering af kollision og lysfølsomme sensorer.

25

I gruppen 204 er der ikoner for et lige og fremadrettet bevægelsesmønster, et fremadrettet zig-zag bevægelsesmønster, en cirkelbevægelse og en bevægelse, der gentager et givet mønster. Disse bevægelsesmønstre er ikke betinget

30 af påvirkning af sensorer og er derfor ubetingede.

I gruppen 205 er der et første ikon for et bevægelsesmønster, der reverseres, når der detekteres en forhindring. Et andet ikon viser et lige og fremadrettet bevægelsesmønster, hvor den fremadrettede bevægelse blot korrigeres ved detektering af en forhindring. Et tredje ikon betin-
5 ger igangsætning af et bevægelsesmønster. Et fjerde ikon stopper et igangværende bevægelsesmønster, når en tryk-sensor er aktiveret. Ikonerne i gruppen 205 repræsenterer således bevægelsesmønstre, der er betinget af trykfølsomme
10 sensorer.

I gruppen 206 er der ikoner for at begynde et bevægelsesmønster, der søger mod den kraftigste lysintensitet henholdsvis et bevægelsesmønster, der søger mod den svageste lysintensitet. Lysintensiteten detekteres ved hjælp af
15 lysfølsomme sensorer. Ikonerne i gruppen 205 repræsenterer således bevægelsesmønstre, der er betinget af lysfølsomme sensorer

I gruppen 207 er der tre identiske ikoner, som kan vises i kombination, for at angive med hvilken tidskonstant de
20 omtalte bevægelsesmønstre skal udføres med. For eksempel kan zig-zag mønstret modificeres ved trinvist at ændre den tid, der skal gå før retningen ændres. Tidskonstanten kan for eksempel være 2 sekunder, 4 sekunder og 7 sekunder.

25 Gruppen 208 omfatter ikoner, der repræsenterer en række specielle effekter. Disse effekter kan for eksempel omfatte afgivelse af forskellige lyd- og lyssignaler eventuelt kombineret med en tilfældig påvirkning af de omtalte bevægelsesmønstre.

30 Det skal bemærkes at displayet kan være af LCD type, LED type eller en anden type. Displayet kan desuden være indrettet til at vise forskellige former for tekstmeddelelser. Ikoner kan også være tekst.

Fig. 3a viser et første diagram for en tilstandsmaskine for visuel programmering af et legetøjsselement. Tilstandsmaskinen er implementeret som et program, der kan udføres af mikroprocessoren 102. Når tilstandsmaskinen ikke afvikler et brugerspecificeret program, og når legetøjsselementet er tændt, vil påvirkning af tasten 'vælg' flytte fokus fra en gruppe af ikoner til en anden gruppe af ikoner. Det at en gruppe af ikoner er i fokus kan vises ved at blinke med et ikon i en gruppe eller alle ikoner i en gruppe. Den viste tilstandsmaskine omfatter tre tilstande 301, 302 og 303 svarende til, at fokus kan skiftes mellem tre forskellige grupper af ikoner.

Tilstandsmaskinen skifter tilstand, når tasterne 'vælg' eller 'skift' aktiveres. Når tasten 'vælg' aktiveres skiftes mellem tilstandene 301, 302 og 303. Når tasten 'skift' aktiveres fortsætter tilstandsmaskinen i et andet sæt tilstande vist på fig. 3b.

Det skal bemærkes, at der kun er angivet tre tilstande i dette diagram svarende til tre grupper af ikoner på displayet 201. Dette er valgt for at gøre diagrammet overskueligt. I praksis må der være et antal tilstande svarende til antallet af grupper af ikoner på displayet.

Fig. 3b viser et andet diagram for en tilstandsmaskine for visuel programmering af et legetøjsselement. Tilstandsmaskinen bliver bragt til disse tilstande, når tasten 'skift' aktiveres. Det antages, at en gruppe af ikoner er bragt i fokus. Når 'skift' aktiveres bringes tilstandsmaskinen i tilstand 304, hvor det første ikon i den gruppe, der er bragt i fokus vises - de andre ikoner i samme gruppe vises ikke.

Hvis tasten 'vælg' aktiveres, bringes tilstandsmaskinen i tilstand 305, hvor 'regel #1' vælges. 'regel #1' svarer til et sæt af instruktioner til mikroprocessoren 102, der

kan udføre et bevægelsesmønster som vist på ikonet 'ikon #1'. Derefter bringes tilstandsmaskinen i tilstand 306, hvor fokus flyttes fra den aktuelle gruppe af ikoner til en næste gruppe af ikoner for valg af et ikon i denne

5 gruppe.

Alternativt hvis tasten 'skift' vælges i tilstand 304 bringes tilstandsmaskinen i tilstand 307, hvor 'ikon #2' vises på displayet - de andre ikoner i samme gruppe vises ikke. Ligesom i tilstand 304 er det i tilstand 307 muligt

10 at vælge en regel svarende til ikonet. Dette gøres ved at aktivere tasten 'vælg', hvorefter tilstandsmaskinen bringes i tilstand 308 for valg af regel 'regel #2'. Efterfølgende i tilstand 309 flyttes fokus til den næste gruppe af ikoner.

15 På tilsvarende vis kan 'ikon #3' vises i tilstand 310 ved aktivering af 'skift'. 'Regel #3' kan vælges ved aktivering af 'vælg', hvorefter fokus flyttes til en næste gruppe.

Ved endnu en aktivering af 'skift' i tilstand 310 vises

20 alle ikoner i gruppen, hvorefter ikonerne i gruppen vises individuelt som beskrevet ovenfor.

I tilstandene 306, 309 og 312 vil aktivering af tasten 'skift' bringe tilstandsmaskinen i en af de respektive tilstande 302 eller 303 eller 301.

25 Det skal bemærkes, at det også er muligt ikke at vælge en regel i en eller flere grupper. I alternative udførelsesformer kan det desuden gøres muligt at vælge flere regler i samme gruppe.

Yderligere skal det bemærkes, at dette diagram svarer til

30 et display med kun tre ikoner i hver gruppe. Dette er valgt for at gøre diagrammet overskueligt. I praksis må

der være et antal tilstande svarende til antallet af ikoner i en given gruppe.

Generelt set vil aktivering af tasten 'kør' 114 bringe tilstandsmaskinen til en tilstand, hvor et program udføres - uanset antallet af valgte regler. Det er således
5 ikke nødvendigt at spørge brugeren om programmet er færdigt eller ej.

Det er muligt springe frem til en ønsket gruppe af ikoner for blot at ændre en regel i et brugerspecificeret program bestående af flere regler.
10

Fig. 3c viser et tredje diagram for afbrydelse af en tilstandsmaskine. Dette diagram viser, hvordan tilstandsmaskinen i tilstand 314 ved aktivering af 'afbryd' lagrer er repræsentation af den tilstand T som mikroprocessoren/tilstandsmaskinen befinder sig i. Derved er det
15 muligt at genoptage et pludseligt afbrudt programmeringsforløb uden at skulle starte forfra. I tilstand 315 slukkes legetøjs-elementet.

Fig. 3d viser et fjerde diagram for start af en tilstandsmaskine. Dette diagram viser, hvordan tilstandsmaskinen ved aktivering af 'start' tænder legetøjs-elementet i tilstand 316. Derefter hentes en tidligere lagret tilstandsrepræsentation T i tilstand 317. I tilstand 318 vises de ikoner, der repræsenterer tilstanden
20 T. I tilstand 319 sættes fokus på ikonerne i gruppe 1, hvorefter tilstandsmaskinen er klar til betjening som beskrevet i forbindelse med fig. 3a, 3b og 3c.

Som det fremgår af den ovenstående beskrivelse af fig. 3a, 3b, 3c og 3d, kan brugeren på simpel vis programmere legetøjs-elementet til at udføre programmer, der omfatter
30 komplicerede funktioner. Programmerne genereres ved at sammensætte en række bestemte regler.

Den ovenfor omtalte tilstandsmaskine kan implementeres på en meget kompakt måde. Det er derved opnået at avancerede og brugerspecificerede funktioner kan udføres i afhængighed af en simpel dialog med brugeren.

- 5 I de tilstande, hvor en regel vælges, det vil sige tilstandene 305, 308 og 311, udfører programsystemet 119 en række operationer, sådan at der genereres et brugerspecificeret program, som kan udføres af mikroprocessoren 102.

- Det brugerspecificerede program kan genereres ved at lag-
10 re en reference (det vil sige en pointer) i hukommelsen 121, der refererer til en regel lagret i hukommelsen 120. Når flere regler vælges til at indgå i det samme brugerspecificerede program, lagres der en liste af referencer til regler i hukommelsen 120 i hukommelsen 121. Et brugerspecificeret program kan således omfatte en eller fle-
15 re regler.

- Alternativt kan det brugerspecificerede program genereres ved at tage en kopi af hver af de valgte regler i hukommelsen 120 og indsætte kopierne i hukommelsen 121, derved
20 vil hukommelsen 121 komme til at indeholde et komplet program. Endvidere kan det brugerspecificerede program genereres som en kombination af referencer til regler og instruktioner til mikroprocessoren 102.

- Det skal bemærkes, at hver regel typisk omfatter et sæt
25 af instruktioner, som kan betragtes som et delprogram, en funktion eller procedure. Men en regel kan også blot omfatte modificering af en parameter for eksempel en parameter, der angiver hastighed for en tilsluttet motor eller en tidskonstant.

- 30 I en hensigtsmæssig udførelsesform for opfindelsen kan der udføres en given handling, når tilstandsmaskinen skifter fra en første til en anden tilstand. En handling

kan for eksempel omfatte signalering med lyd og/eller lys til brugeren for, at indikere hvilken tilstand eller type af tilstand legetøjselementet befinder sig i.

Fig. 4 viser parallel og sekventiel afvikling af programmer. Når der genereres et brugerspecificeret program kan reglerne afvikles som en sekvens af regler, parallelt eller i en kombination af sekventiel og parallel programafvikling.

Et eksempel på to regler der skal udføres parallelt i tid kan være en første regel om at et køretøj skal søge efter lys og en anden regel om at køretøjet skal ændre retning, når det detekterer forhindringer.

Et eksempel på to regler der skal udføres sekventielt i tid kan være en første regel om at et køretøj skal køre ligeud og en anden regel om at køretøjet skal køre i en cirkelbevægelse.

Reglerne R1 401, R2 402, R3 406, R4 405, R5 403 og R6 404 angiver et eksempel på en kombination af sekventiel og parallel programafvikling.

Når regler afvikles som delprogrammer, der udføres parallelt i tid, eller under en eller anden form for tidsdeling mellem delprogrammerne må situationer, hvor flere regler ønsker adgang til en ressource for eksempel i form af en motor kunne håndteres. I en foretrukken udførelsesform håndteres en sådan situation ved at tildele hver af de regler, der kan vælges, et prioritetsnummer. For eksempel kan regler inden for samme gruppe af ikoner på displayet tildeles samme prioritetsnummer. Når operativsystemet 118 detekterer at to regler eller delprogrammer i et tidsrum begge ønsker adgang til en ressource afbrydes eller stoppes den regel som har det laveste prioritetsnummer. Reglen med det højeste prioritetsnummer får der-

efter adgang til at benytte ressourcen. Hvis der kun kan vælges en regel fra samme gruppe af ikoner er der således opnået en entydig og forudsigelig programafvikling af brugerspecificerede programmer.

- 5 Fig. 5 viser et første og et andet legetøjselement, hvor det første legetøjselement kan overføre programmer til det andet legetøjselement. Det første legetøjselement 501 omfatter en mikroprocessor 507, et I/O modul 510, en hukommelse 509 og en brugergrænseflade 508. Endvidere om-
- 10 fatter legetøjselementet 501 en to-vejs kommunikationsenhed 506 for kommunikation via en infrarød sender/modtager 505 eller for kommunikation ved hjælp af en lyskilde/lysdetektor 504, der kan udsende og detektere synligt lys.
- 15 Tilsvarende omfatter det andet legetøjselement 502 en mikroprocessor 514, et I/O modul 515 og en hukommelse 516. Endvidere omfatter legetøjselementet 502 en kommunikationsenhed 513 for kommunikation via en infrarød sender/modtager 512 eller for kommunikation ved hjælp af en
- 20 lyskilde/lysdetektor 511, der kan udsende og detektere synligt lys.

I en foretrukken udførelsesform for opfindelsen kan det første legetøjselement både sende og modtage data, hvorimod det andet legetøjselement kun kan modtage data.

- 25 Data kan overføres som synligt lys via en lysleder 503. Alternativt kan data overføres som infrarødt lys 517 og 518. Data kan være i form af koder, der angiver en specifik instruktion og tilhørende parametre, der kan fortolkes af mikroprocessorerne 507 og/eller 514. Alternative
- 30 kan data være i form af koder der referere til et delfprogram eller regel lagret i hukommelsen 516.

I/O modulerne 510 og 515 kan forbindes til elektroniske enheder (for eksempel motorer) for styring af disse. I/O modulerne 510 og 515 kan også forbindes til elektroniske sensorer, således at enhederne kan styres i afhængighed af detekterede signaler.

I en foretrukken udførelsesform er fiberen 503 indrettet således at en del af det synlige lys, den transmitterer slipper ud gennem fiberen. Derved er det muligt for en bruger - direkte - at følge med i transmissionen. Brugeren kan for eksempel se hvornår kommunikationen starter og stopper.

Lyset gennem fiberen kan overføre data med en given data-transmissionsfrekvens som skift i lysniveauet i fiberen. Data kan transmitteres således at det er muligt for brugeren at observere enkelte lysniveauskift under en transmission (det vil sige ved en passende lav datatransmissionsfrekvens) eller blot at se om transmissionen er i gang (det vil sige ved en passende høj datatransmissionsfrekvens).

Almindeligvis er det uønsket at en del af det lys, der skal transmitteres gennem fiberen slipper ud gennem fiberen. Men i forbindelse med kommunikation mellem to legetøjs-elementer er det en ønsket effekt, da det således er muligt at følge med i kommunikationen på en meget intuitiv måde.

Der er kendt for en fagmand, hvordan det opnås at en del af lyset slipper ud gennem fiberen. Det kan for eksempel lade sig gøre ved at tilføre urenheder til fiberens kappe eller ved at lave mekaniske hak eller mønstre i fiberen. Den del af lyset, der skal slippe ud gennem fiberen kan også styres ved at styre forholdet mellem brydningsindeks i en lysleders kerne og kappe.

Fig. 6 viser en køretøjskonstruktion omfattende et mikroprocessorstyret legetøjsbyggeelement ifølge opfindelsen koblet sammen med almindeligt kendte legetøjsbyggeelementer. Det mikroprocessorstyrede legetøjsbyggeelement 601 er koblet oven på en konstruktion 605 af byggeelementer og to motorer (ikke vist). Motorerne driver et hjul i hver side af køretøjet, hvoraf kun hjul 604 på den ene side af køretøjskonstruktionen kan ses. Hjulene drives af en aksler 604 der via tandhjul 603 er forbundet til motorerne. Motorerne er elektrisk forbundet til legetøjsbyggeelementet 601 ved hjælp af ledninger 615.

Køretøjskonstruktionen omfatter endvidere to bevægelige arme 606, der kan drejes omkring et leje 607 således at armene ved drejning kan bringes til at påvirke et sæt kontakter 608. Kontakterne 608 er elektrisk forbundet til legetøjsselementet 601 via ledninger 609.

Legetøjsselementet kan betjenes via tasterne 613. Displayet 812 kan vise information som beskrevet ovenfor i forbindelse med fig. 2. Legetøjsselementet 601 har et sæt elektriske kontaktflader 610 og 611 hvortil ledningerne 609 og 615 kan tilkobles for henholdsvis modtagelse og afgivelse af signaler. Legetøjsselementerne

Ved passende programmering af legetøjsselementet 601 kan køretøjet bringes til at køre uden om forhindringer, der kan påvirke armene 606.

PATENTKRAV

1. Mikroprocessorstyret legetøjsbyggeelement (101,501) omfattende

5 en mikroprocessor (102,507), der kan udføre instruktioner i form af et program lagret i en hukommelse (117,509);

et display (104,508) integreret i legetøjsbyggeelementet(101,501);

10 koblingsmidler for sammenkobling med byggeelementer, der kan bevæges ved hjælp af manøvreorganer, hvor manøvreorganerne kan styres i afhængighed af instruktionerne,

k e n d e t e g n e t ved,

15 displayet (104,508) omfatter et antal ikoner (204,205,206,207,208), som hver især repræsenterer instruktioner til mikroprocessoren (102,507), og som kan aktiveres af en bruger for programmering af mikroprocessoren og

20 at der signaleres med et første af antallet af ikoner, hvor det første ikon repræsenterer instruktioner, som mikroprocessoren er i gang med at udføre.

2. Mikroprocessorstyret legetøjsbyggeelement ifølge krav 1, k e n d e t e g n e t ved at en første type af ikoner (204,205,206) er udformet til at illustrere bevægelsesmønstre.
- 5 3. Mikroprocessorstyret legetøjsbyggeelement ifølge krav 1 eller 2, k e n d e t e g n e t ved at en anden type af ikoner (207,208) er udformet til at illustrere modifikationer af bevægelsesmønstrene.
- 10 4. Mikroprocessorstyret legetøjsbyggeelement ifølge et vilkårligt af kravene 1-3, k e n d e t e g n e t ved at legetøjet omfatter midler til ved aktivering af en første type af ikoner (204,205,206) at generere et første sæt af instruktioner omfattende parametre, hvilke instruktioner og/eller parametre kan modificeres ved aktivering af en
- 15 anden type af ikoner (207,208).
5. Mikroprocessorstyret legetøjsbyggeelement ifølge et vilkårligt af kravene 1-4, k e n d e t e g n e t ved at mikroprocessoren (102,507) er indrettet til at modtage signaler fra elektriske og/eller elektroniske enheder.
- 20 6. Mikroprocessorstyret legetøjsbyggeelement ifølge krav 5, k e n d e t e g n e t ved at en første gruppe af regler er betinget af en første gruppe af signaler og ved at en anden gruppe af regler (R1-R6) er betinget af en anden gruppe af signaler.
- 25 7. Mikroprocessorstyret legetøjsbyggeelement ifølge et vilkårligt af kravene 1-7, k e n d e t e g n e t ved at instruktioner, svarende til ét ikon, implementerer én regel ved at styre manøvreorganerne i afhængighed af signaler fra elektriske og/eller elektroniske enheder.
- 30 8. Mikroprocessorstyret legetøjsbyggeelement ifølge et vilkårligt af kravene 1-7, k e n d e t e g n e t ved at

mikroprocessoren udfører regler (R1-R6) i form af instruktioner, der styrer enheder, og

hvor reglerne er betingede af en række signaler, og

5 hvor reglerne er ordnet i en i det mindste delvist prioriteret rækkefølge, og

hvor den prioriterede rækkefølge angiver hvilken en af flere regler, der skal have ret til at styre en enhed,

hvilken rækkefølge er ordnet efter de signaler, de er betingede af.

10 9. Mikroprocessorstyret legetøjsbyggeelement ifølge et vilkårligt af kravene 1-8, k e n d e t e g n e t ved at legetøjet omfatter taster (113,114,115) integreret i legetøjet, hvilke taster kan aktivere ikonerne.

15 10. Mikroprocessorstyret legetøjsbyggeelement ifølge et vilkårligt af kravene 1-9, k e n d e t e g n e t ved at legetøjet omfatter kommunikationsmidler (505,504) for modtagelse af kommandoer, der kan omsættes til et program, der kan udføres af mikroprocessoren.

20 11. Mikroprocessorstyret legetøjsbyggeelement ifølge et vilkårligt af kravene 1-10, k e n d e t e g n e t ved at legetøjet omfatter kommunikationsmidler for afsendelse (505,504) af kommandoer.

25 12. Mikroprocessorstyret legetøjsbyggeelement ifølge et vilkårligt af kravene 1-11, k e n d e t e g n e t ved at legetøjet omfatter kommunikationsmidler (504) for overførelse af information via en lysleder (503).

14. Mikroprocessorstyret legetøjsbyggeelement ifølge et vilkårligt af kravene 1-13, k e n d e t e g n e t ved at legetøjet omfatter en langstrakt lysleder (503), hvor-

igennem der kan transmitteres synligt lys i dens længderetning, og hvor lyslederen er indrettet til at lade en del af det lys, der transmitteres slippe ud gennem dens sider.

- 5 15. Legetøjsbyggesæt ifølge et vilkårligt af kravene 1-14, k e n d e t e g n e t ved at omfatte legetøjsbyggelementer med koblingsmidler for indbyrdes sammenkobling.

SAMMENDRAG

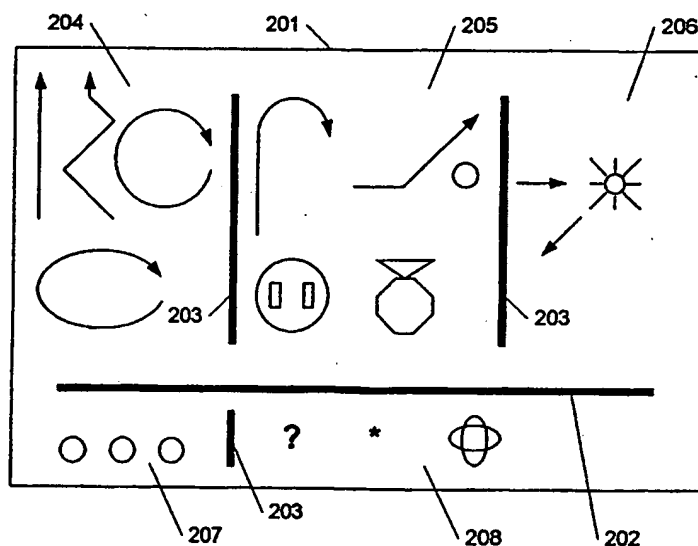
Programmerbart legetøj omfattende en mikroprocessor, der kan udføre instruktioner i form af et program lagret i en hukommelse; et display integreret i legetøjet. Mikroprocessoren er indrettet til at styre elektriske og/eller elektro-mekaniske enheder i afhængighed af instruktionerne, og hvor mikroprocessoren er indrettet til at modtage signaler fra elektriske og/eller elektro-mekaniske enheder. Displayet omfatter en række ikoner, som hver især repræsenterer instruktioner til mikroprocessoren, og som kan aktiveres af en bruger for programmering af mikroprocessoren. Dermed kan legetøjet programmeres ved hjælp af en visuel brugergrænseflade.

(fig. 2)

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷ : A63H 17/395 // 33/00		A1	(11) International Publication Number: WO 00/45924
			(43) International Publication Date: 10 August 2000 (10.08.00)
(21) International Application Number: PCT/DK00/00051		(81) Designated States: AE, AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), DM, EE, EE (Utility model), ES, FI, FI (Utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).	
(22) International Filing Date: 4 February 2000 (04.02.00)			
(30) Priority Data: PA 1999 00143 4 February 1999 (04.02.99) DK			
(71) Applicant (for all designated States except AU BR CA CN GB IE IN MX NZ SG US): LEGO A/S [DK/DK]; Aastvej 1, DK-7190 Billund (DK).			
(71) Applicant (for AU BR CA CN GB IE IN MX NZ SG only): INTERLEGO AG [CH/CH]; Neuhofstrasse 21, CH-6340 Baar (CH).			
(72) Inventors; and			
(75) Inventors/Applicants (for US only): MUNCH, Gaute [DK/DK]; Granslevbyvej 19, DK-8870 Langå (DK). RASMUSSEN, Jesper [DK/DK]; Thit Jensens Vej 37, DK-7182 Bredsted (DK).			
(74) Agent: HOFMAN-BANG A/S; Hans Bekkevolds Allé 7, DK-2900 Hellerup (DK).		Published With international search report. In English translation (filed in Danish).	

(54) Title: A MICROPROCESSOR CONTROLLED TOY BUILDING ELEMENT WITH VISUAL PROGRAMMING



(57) Abstract

A programmable toy comprising a microprocessor which can execute instructions in the form of a program stored in a memory; a display integrated in the toy. The microprocessor is adapted to control electrical and/or electro-mechanical units in response to the instructions, said microprocessor being adapted to receive signals from electrical and/or electro-mechanical units. The display comprises a plurality of icons which each represent instructions for the microprocessor, and which can be activated by a user for programming of the microprocessor. The toy can hereby be programmed by means of a visual user interface.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

6/PATS

A microprocessor controlled toy building element with visual programming

5 This invention relates to a microprocessor controlled toy building element comprising a microprocessor which can execute instructions in the form of a program stored in a memory; a display integrated in the toy; coupling means for coupling with building elements which can be moved by manoeuvring means, said manoeuvring means being control-
10 lable in response to the instructions.

In connection with the development of small, sophisticated and relatively inexpensive microprocessors it has become attractive to use these in many different consumer
15 products - including toys. Generally, the development of toys has proceeded from simple functions such as playing of sounds in dolls, performance of simple patterns of movement in robots, etc., to the development of toys with sophisticated behaviour. The sophisticated behaviour can
20 be recognized by a child playing with the toy and give the impression of a kind of personality. Particularly in connection with construction toys there are many possibilities of giving the toy a behaviour by combining program steps for a microprocessor controlled toy building
25 element with a self-built mechanical structure.

Such programmable construction toys are known from the product ROBOTICS INVENTION SYSTEM from LEGO MINDSTORMS, which is a toy which can be programmed by a computer to
30 detect a plurality of physical signals and to respond to these signals by implementing physical actions. The toy may e.g. be incorporated as a component in a vehicle by combining the toy with other toy building elements, e.g. motors, wheels, collision detectors and light detectors.

WO 90/02983 relates to a robot toy element which is controlled by a microprocessor and which can be programmed via an incorporated keyboard. The robot toy element can
5 move according to patterns of movement and respond to external influences.

US 5,724,074 is an example of a toy element which can be programmed. The toy element can be programmed from an external computer by means of a graphic user interface.
10

The above-mentioned principles of programming toy elements, however, are inexpedient for use in microprocessor controlled toy building elements. Particularly when the
15 microprocessor controlled toy building elements can be coupled with other building elements to form a structure which can perform a pattern of movement, which depends partly on the structure and partly on the program performed by the microprocessor controlled toy building element. In such a situation, a change in the structure after it has been programmed may result in a structure which does not work. This is evident to adults, but to children who play in an intuitive - and partly unstructured - way, this will none the less be a typical situation. The known toy cannot handle such situations in a
25 satisfactory manner.

In view of the prior art in the field, it is a problem that the programming and control facilities for microprocessor controlled toy building elements are insufficient.
30

Accordingly, an object of the invention is to provide improved programming and control facilities for such microprocessor controlled toy building elements.

5 This is achieved when the microprocessor controlled toy building element mentioned initially is characterized in that the display comprises a plurality of icons which each represent instructions for the microprocessor, and which can be activated by a user for programming of the
10 microprocessor, and by signalling with a first one of the plurality of icons, said first icon representing instructions which the microprocessor is executing.

This ensures that the user of the toy receives an indication of which instructions, rules or program steps the
15 microprocessor is programmed to execute - and executes while signalling with the icon. This makes it easy for the child to proceed by the method of trial and error and get assistance in finding errors, if any, in the program
20 or in the structure.

It is thus possible to program a toy element in a simple manner. It is moreover possible to make the toy element perform sophisticated functions based on a few and intuitive
25 activations from a user.

A preferred embodiment of the invention will be described below with reference to the drawing, in which

30 fig. 1 shows a block diagram of a programmable toy element;

fig. 2 shows a display on a toy element;

fig. 3a shows a first diagram of a state machine for visual programming of a toy element;

fig. 3b shows a second diagram of a state machine for
5 visual programming of a toy element;

fig. 3c shows a third diagram for interrupting a state machine;

10 fig. 3d shows a fourth diagram for starting a state machine;

fig. 4 shows parallel and sequential execution of programs;

15

fig. 5 shows first and second toy elements, where the first toy element can transfer data to the second toy element; and

20 fig. 6 shows a toy structure comprising a microprocessor controlled toy building element according to the invention coupled with generally known toy building elements.

Fig. 1 shows a block diagram of a programmable toy element. The toy element 101 comprises a plurality of electronic means for programming the toy element so that it
25 can affect electronic units (e.g. motors) in response to signals picked up from various electronic sensors (e.g. electrical switches).

30

The toy element may hereby be caused to perform sophisticated functions such as e.g. action controlled movement, provided that the toy element is combined with the electronic units/sensors in a suitable manner.

The toy element 101 comprises a microprocessor 102 which is connected to a plurality of units via a communications bus 103. The microprocessor 102 can receive data via the communications bus 103 from two A/D converters "A/D input #1" 105 and "A/D input #2" 106. The A/D converters can pick up discrete multibit signals or simple binary signals. Further, the A/D converters are adapted to detect passive values such as e.g. ohmic resistance.

10

The microprocessor 102 can control electronic units such as e.g. an electric motor (not shown) via a set of terminals "PWM output #1" 107 and "PWM output #2" 108. In a preferred embodiment of the invention the electronic units are controlled by a pulse width modulated signal.

15

Moreover, the toy element can emit sound signals or sound sequences by controlling a sound generator 109, e.g. a loudspeaker or piezoelectric unit.

20

The toy element can emit light signals via the light source "VL output" 110. These light signals can be emitted by means of light emitting diodes. The light emitting diodes may e.g. be adapted to indicate various states of the toy element and the electronic units/sensors. The light signals may furthermore be used as communications signals for other toy elements of a corresponding type. The light signals may e.g. be used for transferring data to a second toy element via a light guide.

25

The toy element can receive light signals via the light detector "VL input" 111. These light signals may be used inter alia for detecting the intensity of the light in the room in which the toy element is present. The light

30

signals may alternatively be received via a light guide and represent data from a second toy element or a personal computer. The same light detector may thus have the function of communicating via a light guide and of serving as a light sensor for detecting the intensity of the light in the room in which the toy element is present.

In a preferred embodiment, the "VL input" 111 is adapted to selectively either communicate via a light guide or alternatively to detect the intensity of the light in the room in which the toy element is present.

Via the infrared light detector "IR input/output" 112 the toy element can transfer data to other toy elements or receive data from other toy elements or e.g. a personal computer.

The microprocessor 102 uses a communications protocol for receiving or transmitting data.

The display 104 and the keys "shift" 113, "run" 114, "select" 115 and "start/interrupt" 116 constitute a user interface for operating/programming the toy element. In a preferred embodiment, the display is an LCD display that can show a plurality of specific icons or symbols. The appearance of the symbols on the display may be controlled individually, e.g. an icon may be visible, be invisible and be caused to flash.

By affecting the keys the toy element may be programmed at the same time as the display provides feedback to a user about the program which is being generated or executed. This will be described more fully below. As the user interface comprises a limited number of elements

(that is a limited number of icons and keys), it is ensured that a child who wants to play with the toy will quickly learn how to operate it.

5 The toy element also comprises a memory 117 in the form of RAM and ROM. The memory contains an operating system "OS" 118 for control of the basic functions of the microprocessor, a program control "PS" 119 capable of controlling the execution of user-specified programs, a plural-
10 ity of rules 120, each rule consisting of a plurality of specific instructions for the microprocessor, and a program 121 in RAM which utilizes the specific rules.

In a preferred embodiment, the toy element is based on a
15 so-called single chip processor which comprises a plurality of inputs and outputs, a memory and a microprocessor in a single integrated circuit.

In a preferred embodiment, the toy element comprises
20 light emitting diodes which can indicate the direction of revolution of connected motors.

In a further embodiment, the toy element comprises incorporated manoeuvring means in the form of e.g. one or more
25 motors with take-off in the form of shafts that are driven by the motors, or in the form of coupling holes with means for receiving part of a shaft and rotating this shaft.

30 Fig. 2 shows a display on a toy element. The display 201 is adapted to show a plurality of specific icons and is shown in a state in which all the icons have been made visible. The icons are divided by horizontal and vertical beams 202 and 203, respectively, into a plurality of

groups 204, 205, 206, 207 and 208 according to their function.

5 The icons may e.g. be designed to illustrate possible patterns of movement for a vehicle. A vehicle may e.g. be constructed by combining the toy element with two motors which can drive a set of wheels at the right-hand side and the left-hand side, respectively, of a vehicle. The vehicle may hereby be controlled to drive forwards, back-
10 wards, to the left and to the right. Further, the vehicle may comprise pressure-sensitive switches for detecting collision and light-sensitive sensors.

15 The group 204 includes icons for a straight and forwardly directed pattern of movement, a forwardly directed zigzag pattern of movement, a circular movement and a movement which repeats a given pattern. These patterns of movement are not conditioned by the action of sensors and are therefore unconditioned.

20

The group 205 includes a first icon for a pattern of movement, which is reversed when an obstacle is detected. A second icon shows a straight and forwardly directed pattern of movement, where the forwardly directed movement is merely corrected by the detection of an obstacle.
25 A third icon conditions initiation of a pattern of movement. A fourth icon stops an ongoing pattern of movement when a pressure sensor is activated. The icons in the group 205 thus represent patterns of movement which are
30 conditioned by pressure-sensitive sensors.

The group 206 includes icons for starting a pattern of movement which moves toward the strongest light intensity and a pattern of movement which moves toward the weakest

light intensity, respectively. The light intensity is detected by means of light-sensitive sensors. The icons in the group 205 thus represent patterns of movement which are conditioned by light-sensitive sensors.

5

The group 207 includes three identical icons which can be displayed in combination to indicate the time constant at which the mentioned patterns of movement are to be performed. For example, the zigzag pattern may be modified
10 by stepwise changing the period of time which has to elapse before the direction is changed. The time constant may e.g. be 2 seconds, 4 seconds and 7 seconds.

The group 208 comprises icons which represent a plurality
15 of special effects. These effects may e.g. comprise emission of various sound and light signals optionally combined with an arbitrary activation of the mentioned patterns of movement.

20 It should be noted that the display may be of LCD type, LED type or another type. The display may moreover be adapted to show various forms of text messages. Icons may also be text.

25 Fig. 3a shows a first diagram of a state machine for visual programming of a toy element. The state machine is implemented as a program which can be executed by the microprocessor 102. When the state machine does not execute a user-specified program, and when the toy element has
30 been turned on, activation of the key "select" will direct focus from one group of icons to another group of icons. That a group of icons is in focus may be shown by flashing an icon in a group or all the icons in a group. The state machine shown comprises three states 301, 302

and 303 corresponding to switching focus between three different groups of icons.

5 The state machine changes states when the keys "select" or "shift" are activated. When the key "select" is activated, switching takes place between the states 301, 302 and 303. When the key "shift" is activated, the state machine continues in another set of states shown in fig. 3b.

10

It should be noted that just three states are indicated in this program, corresponding to three groups of icons on the display 201. This has been chosen in order to make the diagram readily understandable. In practice, there must be a number of states corresponding to the number of groups of icons on the display.

15 Fig. 3b shows a second diagram of a state machine for visual programming of a toy element. The state machine is caused to assume these states when the key "shift" is activated. It is assumed that a group of icons has been focused. When "shift" is activated, the state machine assumes the state 304 in which the first icon in the group which has been focused is activated - the other icons in the same group are not shown.

20 If the key "select" is activated, the state machine assumes the state 305 where "rule #1" is selected. "Rule #1" corresponds to a set of instructions for the micro-processor 102 which can perform a pattern of movement as shown on the icon "icon #1". Then the state machine assumes the state 306 where focus is moved from the current group of icons to another group of icons for the selection of an icon in this group.

30

Alternatively, if the key "shift" is selected in the state 304, the state machine assumes the state 307, where the "icon #2" is shown on the display - the other icons in the same group are not shown. Like in the state 304, it is possible in the state 307 to select a rule corresponding to the icon. This is done by activating the key "select", and then the state machine assumes the state 308 for the selection of the rule "rule #2". Subsequently, in state 309 focus is moved to the next group of icons.

Correspondingly, "icon #3" may be displayed in state 310 by activation of "shift". "Rule #3" may be selected by activation of "select", following which focus is moved to another group.

A further activation of "shift" in the state 310 causes all the icons in the group to be shown, and then the icons in the group are shown individually as described above.

In the states 306, 309 and 312, activation of the key "shift" will cause the state machine to assume one of the respective states 302 or 303 or 301.

It should be noted that it is also possible not to select a rule in one or more groups. In alternative embodiments, it can moreover be made possible to select several rules in the same group.

Additionally, it should be noted that this diagram corresponds to a display with just three icons in each group. This has been chosen to make the diagram readily under-

standable. In practice, there must be a number of states corresponding to the number of icons in a given group.

5 Generally, activation of the key "run" 114 will cause the state machine to assume a state in which a program is executed - irrespective of the number of selected rules. Thus, it is not necessary to ask the user whether the program is ready or not.

10 It is possible to jump to a desired group of icons in order just to change a rule in a user-specified program consisting of several rules.

15 Fig. 3c shows a third diagram for the interruption of a state machine. This diagram shows how the state machine in state 314, upon activation of "interrupt", stores a representation of the state T in which the microprocessor/state machine is present. It is hereby possible to resume a suddenly interrupted programming course without
20 having to start from scratch. The toy element is turned off in state 315.

Fig. 3d shows a fourth diagram for starting a state machine. This diagram shows how the state machine, upon ac-
25 tivation of "start", turns on the toy element in state 316. Then, a previously stored state representation T is retrieved in state 317. In state 318, the icons representing the state T are shown. In state 319, the icons in group 1 are focused, and then the state machine is ready
30 for operation as described in connection with figs. 3a, 3b and 3c.

As will appear from the above description of figs. 3a, 3b, 3c and 3d, the user can program the toy element in a

simple manner to execute programs which comprise complicated functions. The programs are generated by combining a number of specific rules.

- 5 The state machine described above may be implemented in a very compact manner. It is ensured hereby that sophisticated and user-specified functions can be performed in response to a simple dialogue with the user.
- 10 In the states where a rule is selected, that is the states 305, 308 and 311, the program system 119 executes a number of operations, thereby generating a user-specified program which can be executed by the microprocessor 102.
- 15 The user-specified program can be generated by storing a reference (that is a pointer) in the memory 121 which refers to a rule stored in the memory 120. When several rules are selected to be included in the same user-specified
- 20 program, a list of references to rules in the memory 120 is stored in the memory 121. A user-specified program may thus comprise one or more rules.
- Alternatively, the user-specified program may be generated by making a copy of each of the selected rules in
- 25 the memory 120 and inserting the copies into the memory 121; the memory 121 will hereby contain a complete program. Furthermore, the user-specified program may be generated as a combination of references to rules and instructions to the microprocessor 102.
- 30

It should be noted that each rule typically comprises a set of instructions which may be considered a subprogram, a function or a procedure. But a rule may also just com-

prise modification of a parameter e.g. a parameter which indicates the speed of a connected motor or a time constant.

- 5 In an expedient embodiment of the invention, a given action may be performed when the state machine changes from a first state to a second state. An action may e.g. comprise signalling with sound and/or light to the user to indicate the state or type of state which the toy element
10 has assumed.

Fig. 4 shows parallel and sequential execution of programs. When a user-specified program is generated, the rules may be executed as a sequence of rules, in parallel
15 or in a combination of sequential and parallel program execution.

An example of two rules to be executed in parallel in time may be a first rule that a vehicle is to search for
20 light, and a second rule that the vehicle is to change its direction when it detects obstacles.

An example of two rules to be performed sequentially in time may be a first rule that a vehicle is to drive
25 straight ahead, and a second rule that the vehicle is to drive in a circular movement.

Rules R1 401, R2 402, R3 406, R4 405, R5 403 and R6 404 provide an example of a combination of sequential and
30 parallel program execution.

When rules are executed as subprograms run in parallel in time, or in some form of time division between the subprograms, it must be possible to handle situations in

which several rules want access to a resource e.g. in the form of a motor. In a preferred embodiment, such a situation is handled by allocating a priority number to each of the rules which may be selected. For example, rules within the same group of icons on the display may be given the same priority number. When the operating system 118 detects that two rules or subprograms both want access to a resource within a period of time, the rule having the lowest priority number is interrupted or stopped. The rule with the highest priority number is then allowed to use the resource. If only one rule can be selected from the same group of icons, a unique and predictable program execution of user-specified programs is thus achieved.

15

Fig. 5 shows first and second toy elements, where the first toy element can transfer programs to the second toy element. The first toy element 501 comprises a microprocessor 507, a I/O module 510, a memory 509 and a user interface 508. The toy element 501 moreover comprises a two-way communications unit 506 for communication via an infrared transmitter/receiver 505 or for communication by means of a light source/light detector 504 which can emit and detect visible light.

25

Correspondingly, the second toy element 502 comprises a microprocessor 514, a I/O module 515 and a memory 516. The toy element 502 moreover comprises a communications unit 513 for communication via an infrared transmitter/receiver 512 or for communication by means of a light source/light detector 511 which can emit and detect visible light.

30

In a preferred embodiment of the invention, the first toy element can both transmit and receive data, while the second toy element can only receive data.

- 5 Data can be transferred as visible light via a light guide 503. Alternatively, data may be transferred as infrared light 517 and 518. Data may be in the form of codes that indicate a specific instruction and associated parameters which can be interpreted by the microproces-
- 10 sors 507 and/or 514. Alternatively, data may be in the form of codes which refer to a subprogram or rule stored in the memory 516.

- The I/O modules 510 and 515 may be connected to elec-
- 15 tronic units (e.g. motors) for control of these. The I/O modules 510 and 515 may also be connected to electronic sensors so that the units may be controlled in response to detected signals.

- 20 In a preferred embodiment, the fibre 503 is adapted such that part of the visible light transmitted by it escapes from the fibre. It is hereby possible for a user - directly - to watch the transmission. The user can e.g. see when the communication begins and stops.

- 25 The light through the fibre can transfer data with a given data transmission frequency as changes in the light level in the fibre. Data may be transmitted such that it is possible for the user to observe individual light
- 30 level changes during a transmission (that is at a suitably low data transmission frequency), or merely by seeing whether the transmission is going on (that is at a suitably high data transmission frequency).

Generally, it is undesirable that part of the light to be transmitted through the fibre escapes from the fibre. But in connection with communication between two toy elements, it is a desired effect, since it is then possible to watch the communication in a very intuitive manner.

It is known to a skilled person how to ensure that part of the light escapes from the fibre. It can e.g. be done by imparting impurities to the sheath of the fibre, or by making mechanical notches or patterns in the fibre. The part of the light which is to escape from the fibre may also be controlled by controlling the ratio of the refractive index of a core to that of a sheath of a light guide.

Fig. 6 shows a toy structure comprising a microprocessor controlled toy building element according to the invention coupled together with generally known toy building elements. The microprocessor controlled toy building element 601 is coupled on top of a structure 605 of building elements and two motors (not shown). The motors drive a wheel at each side of the vehicle, of which only the wheel 604 on one side of the toy structure is visible. The wheels are driven by a shaft 604 which is connected with the motor via gear wheels 603. The motors are electrically connected to the toy building element 601 by means of wires 615.

The toy structure moreover comprises two movable arms 606 which are pivotable about a bearing 607, so that the arms, when being pivoted, can be caused to affect a set of switches 608. The switches 608 are electrically connected to the toy element 601 via wires 609.

The toy element may be operated via the keys 613. The display 812 can show information, as described above in connection with fig. 2. The toy element 601 has a set of electrical contact faces 610 and 611, to which the wires
5 609 and 615 may be connected for receiving signals and emitting signals, respectively.

By suitable programming of the toy element 601 the vehicle may be caused to drive round obstacles that may af-
10 fect the arms 606.

PATENT CLAIMS

1. A microprocessor controlled toy building element
(101, 501) comprising

5

a microprocessor (102, 507) which can execute instructions in the form of a program stored in a memory (117, 509);

10 a display (104, 508) integrated in the toy building element (101, 501);

coupling means for coupling with building elements which can be moved by manoeuvring means, said manoeuvring means
15 being controllable in response to the instructions,

c h a r a c t e r i z e d in that

the display (104, 508) comprises a plurality of icons
20 (204, 205, 206, 207, 208) which each represent instructions for the microprocessor (102, 507), and which can be activated by a user for programming of the microprocessor, and by

25 signalling with a first one of the plurality of icons, said first icon representing instructions which the microprocessor is executing.

2. A microprocessor controlled toy building element according to claim 1, c h a r a c t e r i z e d in that a
30 first type of icons (204, 205, 206) is configured to illustrate patterns of movement.

3. A microprocessor controlled toy building element according to claim 1 or 2, characterized in that a second type of icons (207, 208) is configured to illustrate modifications of patterns of movement.

5

4. A microprocessor controlled toy building element according to any one of claims 1-3, characterized in that the toy comprises means for generating a first set of instructions comprising parameters upon activation of a first type of icons (204, 205, 206), which instructions and/or parameters may be modified by activation of a second type of icons (207, 208).

10

5. A microprocessor controlled toy building element according to any one of claims 1-4, characterized in that the microprocessor (102, 507) is adapted to receive signals from electrical and/or electronic units.

15

6. A microprocessor controlled toy building element according to claim 5, characterized in that a first group of rules is conditioned by a first group of signals, and that a second group of rules (R1-R6) is conditioned by a second group of signals.

20

25

7. A microprocessor controlled toy building element according to any one of claims 1-7, characterized in that instructions corresponding to one icon implement one rule by controlling the manoeuvring means in response to signals from electrical and/or electronic units.

30

8. A microprocessor controlled toy building element according to any one of claims 1-7, characterized in that

i z e d in that the microprocessor executes rules (R1-R6) in the form of instructions which control units,

said rules being conditioned by a plurality of signals,

5

said rules being arranged in an at least partly prioritized order,

said prioritized order indicating which one of several rules is to be allowed to control a unit,

10

said order being arranged according to the signals by which they are conditioned.

15 9. A microprocessor controlled toy building element according to any one of claims 1-8, c h a r a c t e r - i z e d in that the toy comprises keys (113, 114, 115) integrated in the toy, said keys being capable of activating the icons.

20

10. A microprocessor controlled toy building element according to any one of claims 1-9, c h a r a c t e r - i z e d in that the toy comprises communications means (505, 504) for receiving commands which can be converted into a program that can be executed by the microprocessor.

25

11. A microprocessor controlled toy building element according to any one of claims 1-10, c h a r a c t e r - i z e d in that the toy comprises communications means for transmission (505, 504) of commands.

30

12. A microprocessor controlled toy building element according to any one of claims 1-11, c h a r a c t e r -

i z e d in that the toy comprises communications means (54) for transferring information via a light guide (503).

5 14. A microprocessor controlled toy building element according to any one of claims 1-13, c h a r a c t e r -
i z e d in that the toy comprises an elongated light
guide (503), through which visible light may be transmit-
ted in its longitudinal direction, said light guide being
10 adapted to allow part of the light transmitted to escape
through its sides.

15 15. A toy building set according to any one of claims 1-
14, c h a r a c t e r i z e d by comprising toy build-
ing elements with coupling means for mutual coupling.

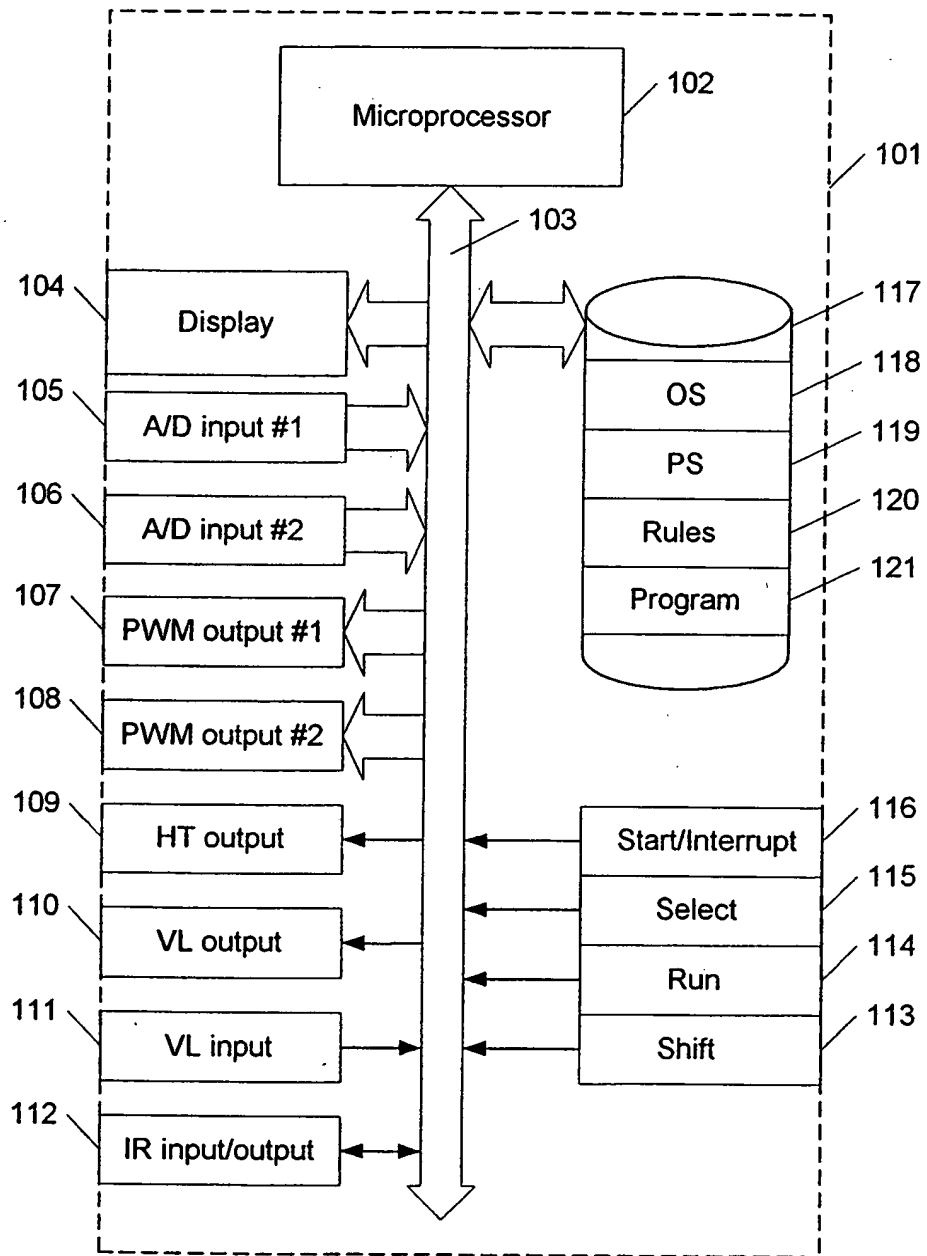


Fig. 1

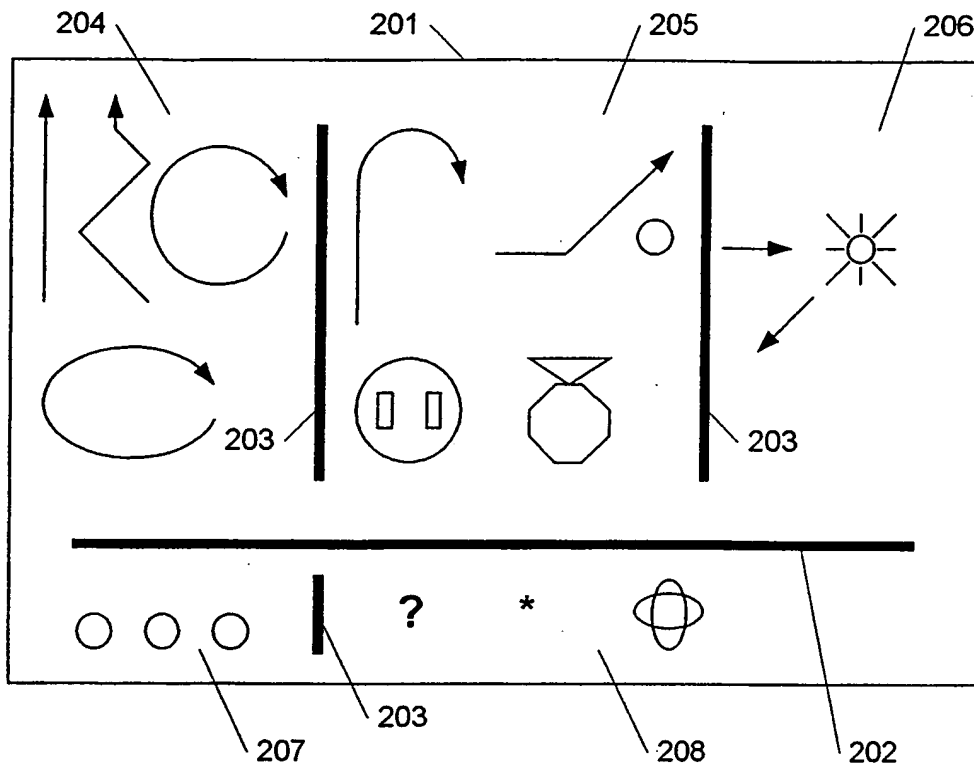


Fig. 2

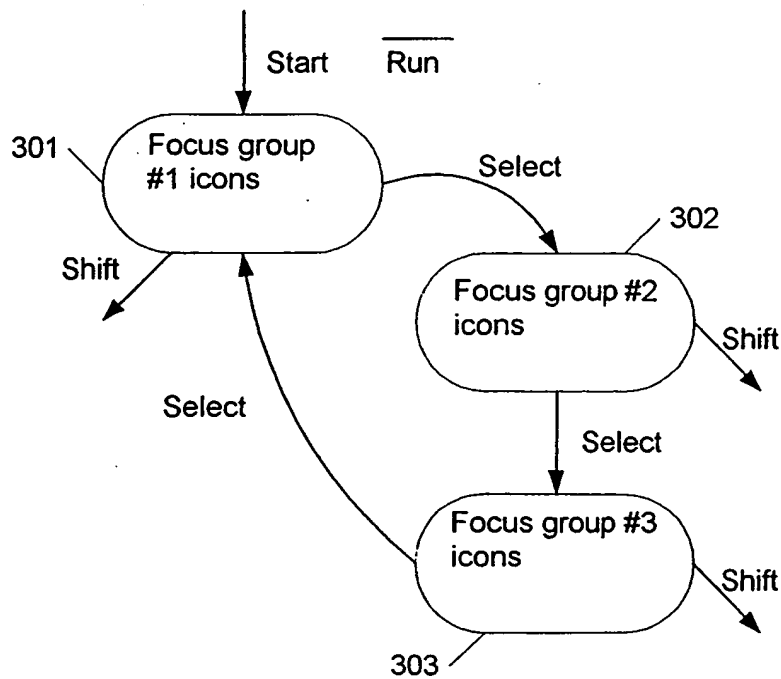


Fig. 3a

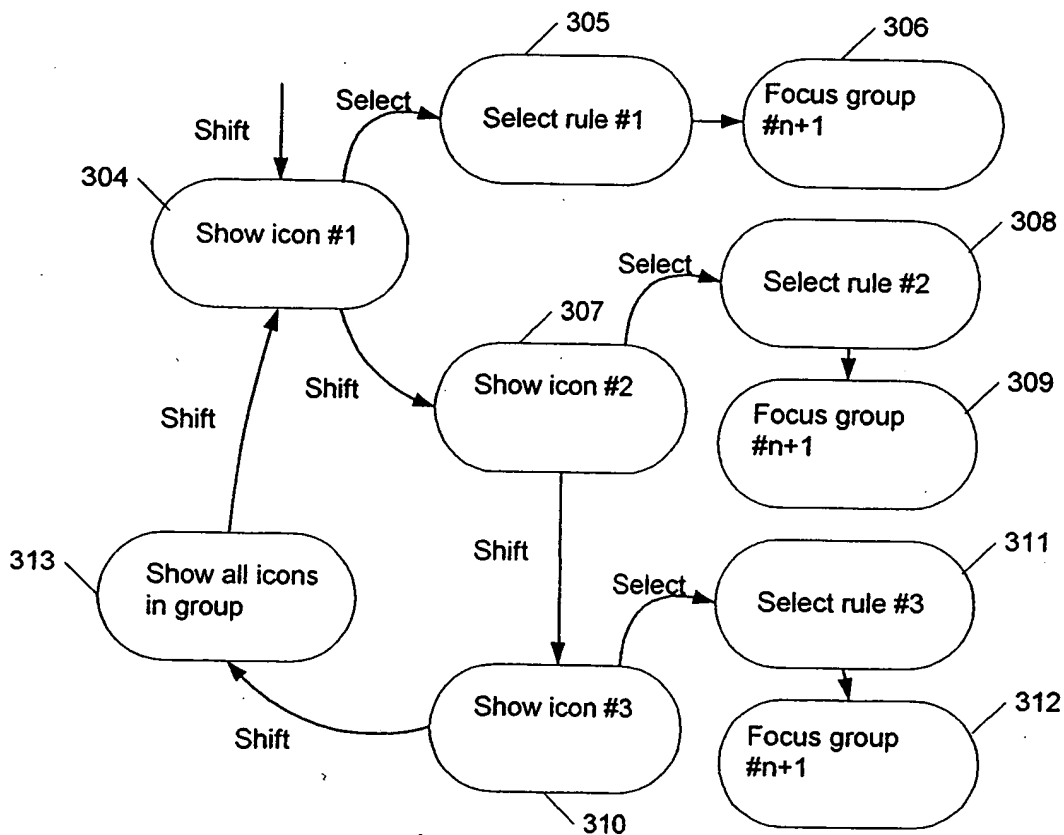


Fig. 3b

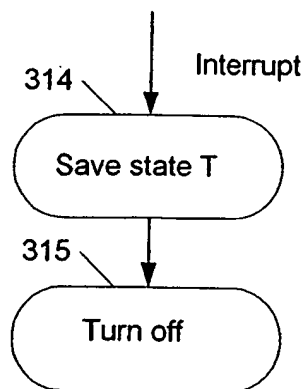


Fig. 3c

4/6

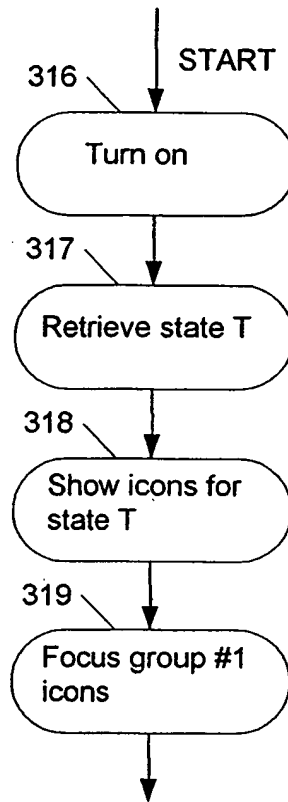


Fig. 3d

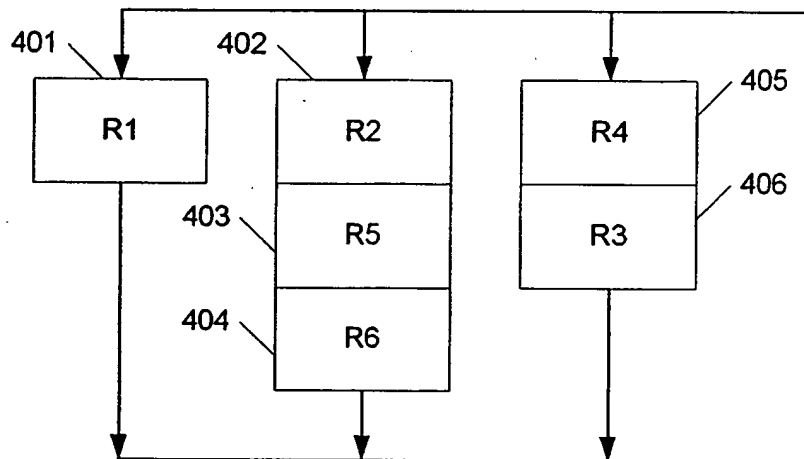


Fig. 4

5/6

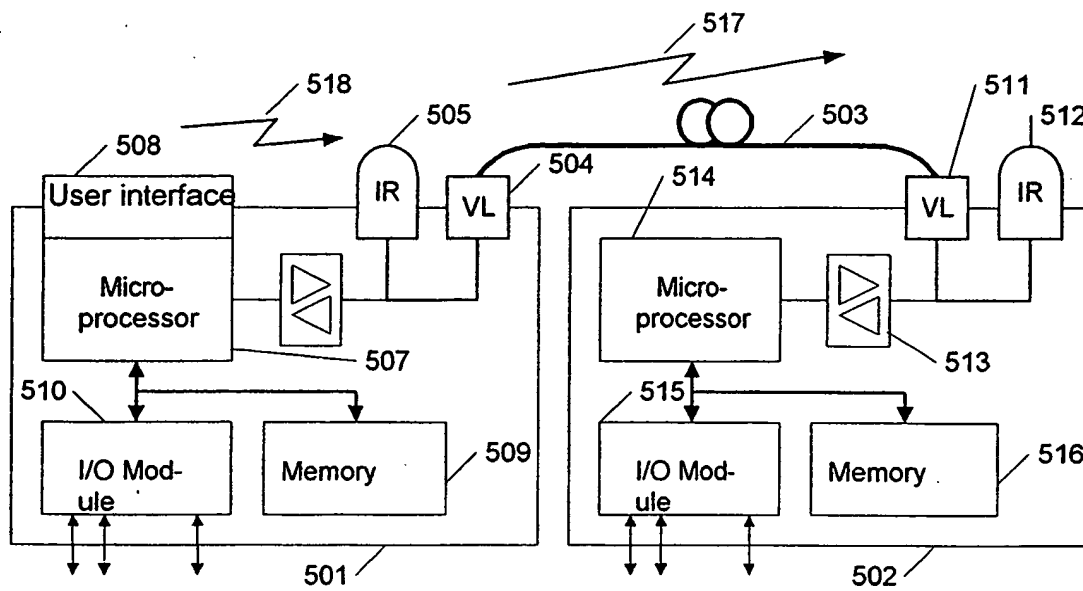


Fig. 5

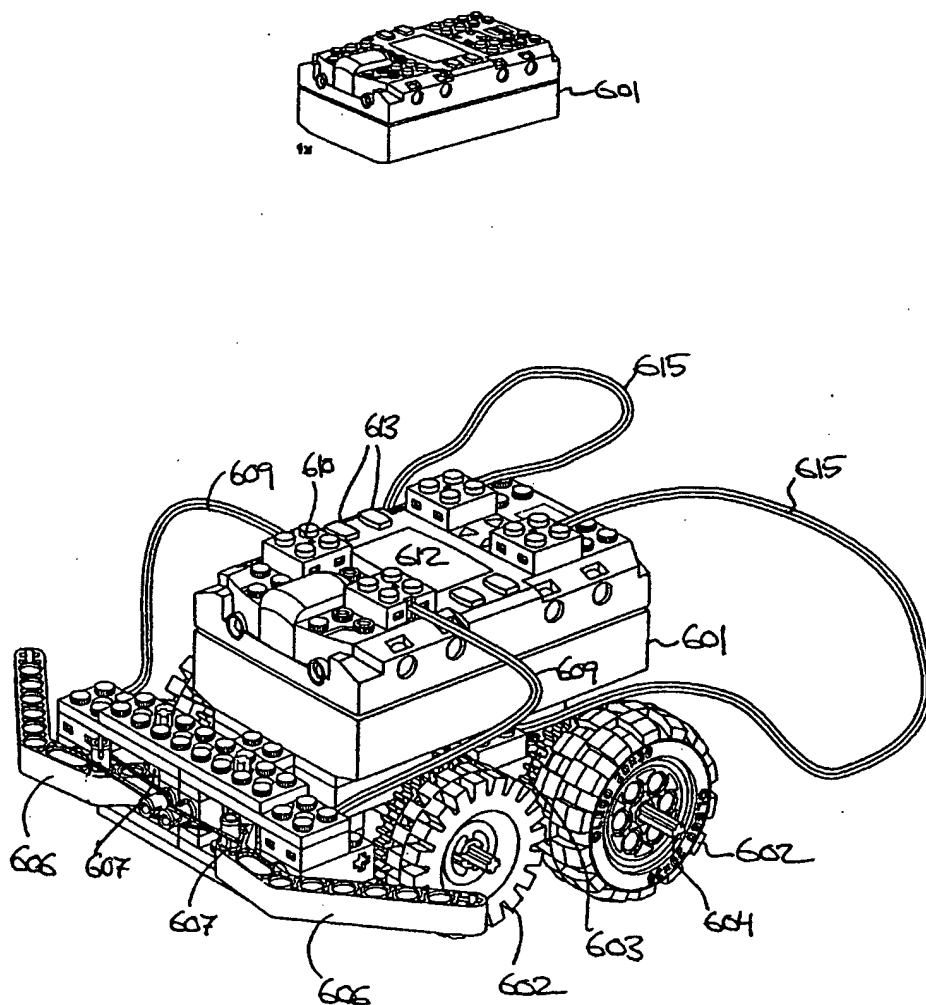


Fig. 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 00/00051

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: A63H 17/395 // A63H 033/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: A63H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0930595 A1 (MUMBLES SCIENCE ADVENTURE LIMITED), 21 July 1999 (21.07.99), abstract	1-15
	--	
A	US 4802879 A (RISSMAN ET AL.), 7 February 1989 (07.02.89), abstract	1-15
	--	
A	US 5724074 A (CHAINANI ET AL.), 3 March 1998 (03.03.98), abstract	1-15
	--	
A	US 5908345 A (CHOI), 1 June 1999 (01.06.99), abstract	1-15
	--	

☐ Further documents are listed in the continuation of Box C.
 ☒ See patent family annex.

Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search

Date of mailing of the international search report

17 May 2000

23 -05- 2000

Name and mailing address of the ISA:

Authorized officer

INTERNATIONAL SEARCH REPORT

Information on patent family members

02/12/99

International application No.

PCT/DK 00/00051

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0930595 A1	21/07/99	AU 6845598 A	22/10/98
		EP 0904501 A	31/03/99
		GB 2329448 A	24/03/99
		GB 2333376 A	21/07/99
		GB 9800941 D	00/00/00
		GB 9825508 D	00/00/00
US 4802879 A	07/02/89	US 4813907 A	21/03/89
US 5724074 A	03/03/98	US 5656907 A	12/08/97
		US 5697829 A	16/12/97
US 5908345 A	01/06/99	AU 1594699 A	02/08/99
		WO 9936146 A	22/07/99